



Mining Almanack,

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UNDER THE SANCTION AND PATRONAGE OF

HIS ROYAL HIGHNESS PRINCE ALBERT,

*Lord Warden of the Stannaries, Chief Steward of the Duchy of  
Cornwall and Devon, &c. &c.*

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# THE MINING ALMANACK

For 1850,

BEING A YEARLY COMPENDIUM

OF

INFORMATION ON GENERAL SCIENCE,

WITH

TABULAR AND OTHER STATISTICAL DETAILS

RELATING TO

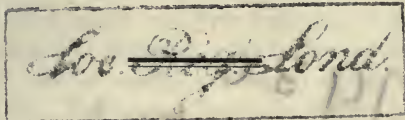
*The Mining Interests.*

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COMPILED AND ARRANGED BY

HENRY ENGLISH, MINING ENGINEER,

*Editor of the "Mining Journal," &c. &c.*



LONDON:

PUBLISHED AT THE MINING JOURNAL OFFICE, 26, FLEET STREET.

1850.

Nov 26 1850

Printed by J. & H. Cox (Brothers), 74 & 75, Great Queen Street,  
Lincoln's-Inn Fields.

7930  
1711190  
1850-1  
2 vols



TO

HIS ROYAL HIGHNESS PRINCE ALBERT,

LORD WARDEN OF THE STANNARIES,

*Chief Steward of the Duchy of Cornwall and Devon, &c. &c.*

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MAY IT PLEASE YOUR ROYAL HIGHNESS,

THE august sanction and patronage bestowed by your Royal Highness on the first publication of the MINING ALMANACK, while it evinces a desire on the part of your Royal Highness to patronize and uphold the mining enterprise of this country, has, I am proud to say, elicited from parties engaged in mining pursuits an equally laudable desire to promote the mineral interests of the United Kingdom.

The tabular matter embodied in the present volume is one of the surest guidances to the objects which its publication has in view—that of conveying to the practical miner those views and opinions which may have been deemed theoretical, but which, when well consulted, will be best understood as adding to our national wealth, and displaying our enterprise and perseverance. That science should be further manifested and developed, no doubt can exist, and it is to your Royal Highness that we look for support, fostered as such is by the labours and exertions of the Museum of Practical Geology, under the supervision of Sir H. De la Beche, which, it is to

#### DEDICATION.

be hoped, will render us not only more efficient, but be of benefit to our own nation, and to the world in general.

The evidence afforded by your Royal Highness, in emanating and supporting the Exhibition of Industry of all Nations for 1851, is in itself internal testimony of your desire to promote the interests of the country with which you are so intimately allied by the greatest of all ties—as consort of our illustrious and well-beloved sovereign,—and thus, by your exalted position, so ably calculated to aid in the development of the useful sciences, which have rendered this country the first of nations, and which have justly endeared your Royal Highness to the hearts of Englishmen, as the promoter and patron of those objects.

The condescension on the part of your Royal Highness in affording your patronage to the present work, allows me to convey to you my grateful thanks and acknowledgments for the benefits conferred by you on the scientific and operative world.

I have the honour,

With every grateful feeling and respect,

To subscribe myself,

Your Royal Highness's

Most obedient, humble servant,

HENRY ENGLISH.

25, FLEET STREET,

29th May, 1850.

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# MINING ALMANACK FOR 1849.

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IN addition to the CALENDAR, LISTS of SCIENTIFIC BODIES, and much valuable TABULAR and STATISTICAL MATTER, together with the DIRECTORY for that year, will be found the following

## ORIGINAL PAPERS.

- Jurisdiction and Practice of the Stannaries Courts. By H. S. Stokes, Esq.  
On the Utility of a Knowledge of Engineering, &c. By P. N. Johnson, Esq., F.R.S., F.G.S., &c.  
On the Economy of Mining in Cornwall. By James Sims, M.E.  
On the Application of Geological Science. By T. Sopwith, Esq., F.R.S., &c.  
On the Duties and Acquirements of Engineers. By E. Hopkins, C.E., F.G.S.  
On the Newcastle and Durham Coal Fields. By M. Dunn, Esq., M.E.  
On the Custom of Tin Bounds. By E. Smirke, Esq.  
Societies for the Improvement of the Working Miner and Collier. By the Editor.  
Records of Ancient Mining. By J. Y. Watson, Esq., F.G.S.  
Rise and Progress of the Cornish Steam Engine. By James Sims, M.E.  
On the Structure of the Crystalline Rocks. By E. Hopkins, C.E., F.G.S.  
On Applying Atmospheric Exhaustion to Mining and Engineering Works. By T. Clark, C.E.  
Benevolent Institutions connected with Mining Industry. By the Editor.  
On the Superficial Production of Gold, Oxide of Tin, &c. By E. Hopkins, C.E., F.G.S.  
On the Utility of a Knowledge of Assaying and Analysis in the Treatment of Metallic Ores in the Smelting Process. By P. N. Johnson, F.R.S., F.G.S., &c.  
Explosions of Fire-Damp connected with Falls in the Barometer. By Professor D. T. Ansted, &c.  
On the General Character of the Crystalline Rocks called "Primary." By E. Hopkins, C.E., F.G.S.  
On Tin Ores and Black Tin. By P. N. Johnson, F.R.S., F.G.S., &c.  
On Gold Deposits and Washings. By José E. Cliffe, M.D., F.G.S.  
On Accidents in Mines. By the Editor.  
On Iron in the form of Wire as a Substitute for Hemp. By the Editor.  
Improvements in Generating Steam and Evaporating Fluids. By the Editor.  
Process of Carbonizing Turf without Close Vessels. By Dominique Albert, LL.D.  
The Cost-Book System. By the Editor.  
The Mineral Topography of Great Britain. By A. W. Tooke, M.A., F.G.S., &c.  
Mineralogy. By George Abbot, Esq.  
Lives of Eminent Engineers:—  
    Life of James Watt. By the Editor.  
    Life of Richard Trevithick, C.E. By Hyde Clarke, Esq.  
    Life of George Stephenson, C.E. By Hyde Clarke, Esq.  
    Berzelius.  
Rules and Regulations for Working the Gales, &c. in the Forest of Dean.  
On the Laws and Customs relating to Mining, and the Decisions thereon. By the Editor.  
Abstract of an Act for the Registration, Incorporation, and Regulation of Joint-Stock Companies.  
Abstract of an Act for the Winding-up of Joint-Stock Companies.  
Miscellanea.  
Glossary of Mining Terms.



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# Mining Almanack.

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1850.

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**PART I.**



January was placed as leader of the months by Numa Pompilius when he added two months (January and February) to the Alban calendar, though it was not admitted to the same precedence in this country until a motion was made to that effect on the 18th March, 1750. The name is derived from Janus, the god of the year in the Roman mythology, to whom the day was sacred. They sacrificed to him on the 9th day, to Jove on the 13th and 31st. Janus presided over gates and avenues; thus, symbolically, he admitted the new year, and attended the departure of the old. The idol was placed over the gate of a temple at Rome, represented with two faces; the one that of an old man, typical of his retrospect of the past, and the other a youthful countenance, denoting prospect of the future.

### Ticketings, Pay Days, &c.

1. T. North Pool account on the Mine.
2. W. Devon Consols and other Mines Sampling.
3. Th. Ticketing at Redruth, N. Roskear, N. Pool, Seton, &c.
4. F. Carn Brea, E. Pool, and S. Basset pay. County Court, Truro.
5. S. Devon Consols, West Jewel, Dolcoath, Stray Park, and Par Consols pay and setting. County Court, Falmouth.
6. S.
7. M. South Francis account on the Mine. Par Consols Sampling. County Court, Helston.
8. T. County Court, Penzance.
9. W. Consols, United, &c. Sampling. County Court, Redruth.
10. Th. Ticketing at Redruth, Carn Brea, and other Mines.
11. F. North Pool setting. County Court at St. Columb. West Caradon and Gonamena pay.
12. S. East Wheal Crofty pay.
13. S.
14. M. N. Roskear acc. on the Mines. Fowey Consols Sampling.
15. T. Devon Consols account. West Buller account.
16. W. Consols acc. on the Mine. N. Pool, Seton, &c. Sampling.
17. Th. Ticketing at Truro, Devon Consols, and other Mines.
18. F. United Mines account. Budnick pay. Levant Tut pay.
19. S. Agar West Buller, Consols, United, Comfort, Trevisky, Wh. Agar, and Seton pay. Fowey Consols pay and setting.
20. S.
21. M. Trevisky account. Par Consols Sampling.
22. T. West Wheal Seton and East Crofty account on the Mine.
23. W. Carn Brea, &c. Sampling. South Tolgus ac. on the Mine.
24. Th. Ticketing at Truro, Consols, United, and other Mines.
25. F. North Pool pay. East Wheal Crofty setting.
26. S. Tresavean, Trethellan, Grambler, and North Roskear pay. Fowey Consols and Condurrow pay and setting.
27. S.
28. M.
29. T. Tresavean account on the Mine.
30. W. No Sampling Copper Ore this week.
31. Th. Ticketing at Redruth. N. Pool, Seton, and other Mines.



## Anniversaries, &amp;c.

1. T. Circumcision. Union of Great Britain and Ireland, 1801.  
E. Burke born, 1730.
2. W. General Wolfe born, 1727.
3. Th. Cicero born, B.C. 107.
4. F. West Indies discovered, 1492.
5. S. Dividends due. Edward the Confessor died, 1066. Duke  
of York died, 1827.
6. S. EPIPHANY. Twelfth day. Joan of Arc born, 1402. Me-  
tastasio born, 1698.
7. M. Allan Ramsay died, 1763. Fire Insurance expires.
8. T. Sun rises at 8, sets at 4. Cape of Good Hope taken, 1806.
9. W. Fontenelle died, 1757. Severe frost, 1814.
10. Th. Royal Exchange burnt, 1838.
11. F. Sir Hans Sloane died, 1752. Roubilliac died, 1762. Lin-  
næus died, 1778. Hilary Term begins.
12. S. Lavater died, 1801.
13. S. FIRST SUNDAY AFTER EPIPHANY. C. J. Fox born, 1749.
14. M. Cambridge and Oxford Term begins.
15. T. Queen Elizabeth crowned, 1599. Dr. Aikin died, 1747.  
Cotton first imported into Liverpool, 1785. Library,  
British Museum founded, 1823.
16. W. Edward Gibbon died, 1794.
17. Th. Franklin born, 1706. Algieri born, 1749.
18. F. Prisca. Old Twelfth Day. Houses of York and Lancaster  
united, 1486.
19. S. Copernicus born, 1473. Congreve died, 1729. James Watt  
born, 1736. American independence, 1783.
20. S. SECOND SUNDAY AFTER EPIPHANY. St. Fabian. First  
English Parliament, 1269. Australia colonized, 1788.
21. M. St. Agnes. Louis XVI. beheaded, 1793.
22. T. St. Vincent. Bacon born, 1561. Washington born, 1732.  
Byron born, 1788.
23. W. William Pitt died, 1806.
24. Th. Frederick the Great born, 1712.
25. F. Conversion of St. Paul. Burns born, 1759.
26. S. Brazil discovered, 1496. Dr. Jenner died, 1823.
27. S. SEPTUAGESIMA SUNDAY. Mozart born, 1756. Dr. C.  
Hutton died, 1823.
28. M. Sir F. Drake died, 1596. Peter the Great died, 1725.  
Admiral Byng shot, 1757. Defeat of the Sikhs at Aliwal.
29. T. George III. died, 1820. First Stone Westminster Bridge  
laid, 1738.
30. W. King Charles I. martyrdom, 1648.
31. Th. St. Peter Nolasco. Ben Jonson born, 1574. London  
Docks opened, 1805.

February was made the second month by Numa Pompilius. Its name is derived from *Februa*, a title the Romans gave to the Ferialia sacrifices, or feast in honour of the ghosts, held on the 11th day, the Lupercalia, in honour of Pan, the god of hunters and shepherds, on the 15th, and the Terminalia, or feast in honour of Terminus, the guardian of boundaries and landmarks, on the 22nd ; also from *februo*, to purify. This being originally held as the last month of the year, people offered an expiatory sacrifice for their twelve months' sin.

### Ticketings, Pay Days, &c.

1. F. Tin Croft, Carn Brea, South Wheal Basset, and East Pool pay and setting.
2. S. Devon Consols, Dolcoath, Stray Park, Par Consols, and West Fowey pay and setting. Vice Warden's Court opens at Truro. Wheal Mary pay.
3. S.
4. M. Fowey Consols Sampling.
5. T. South Wheal Basset account on the Mine.
6. W. Devon Consols, &c. Sampling. County Court, Bodmin.
7. Th. Ticketing at Redruth, Carn Brea, and other Mines. County Court, St. Austell.
8. F. Stray Park acc. N. Pool setting. County Court, Truro. West Caradon and Gonamena pay.
9. S. County Court, Falmouth. Par Consols pay.
10. S.
11. M. Wheal Seton account on the Mine. County Court, Helston. Par Consols Sampling.
12. T. County Court, Penzance. Fowey Consols account.
13. W. Wheal Mary account on the Mine. United, Par, South Caradon, and other Mines Sampling.
14. Th. No ticketing this week. County Court, Redruth.
15. F. Levant and Budnick pay. County Court, St. Columb.
16. S. Trevisky pay. Fowey and Prideaux Wood Mines setting and pay.
17. S.
18. M. Condurrow account on the Mine. Fowey Consols Sampling.
19. T. East Pool account on the Mine.
20. W. North Roskear, North Pool, and other Mines Sampling.
21. Th. Ticketing at Redruth, Devon Consols, and other Mines.
22. F. North Pool pay day. East Wheal Crofty setting.
23. S. Tresavean, Trethellan, Grambler, Wheal Seton, North Roskear, South Wheal Francis, United Mines, Tywarnhayle, Agar, Consols, and Fowey Consols pay. Condurrow pay and setting.
24. S.
25. M. Par Consols Sampling.
26. T. North Pool account on the Mine.
27. W. Carn Brea and other Mines Sampling.
28. Th. Ticketing at Lenderyon's Hotel, Truro. United, &c.

## Anniversaries, &amp;c.

1. F. St. Ignatius. St. Bridget. New River begun, 1608.
2. S. Candlemas Day. Purification.
3. S. SEXAGESIMA SUNDAY. St. Blaze. John of Gaunt died, 1399. Monte Video taken, 1807. Silver fourpenny-pieces issued, 1836.
4. M. Cato died, B.C. 46. Fair held on the Thames, 1814.
5. T. St. Agatha. Sir R. Peel born, 1788. Galvani died, 1799. Regalia of Scotland found, 1818.
6. W. Charles II. died, 1685.
7. Th. Mrs. Radcliffe died, 1823.
8. F. Mary Queen of Scots beheaded, 1587. Butler born, 1612.
9. S. Bank of England established, 1691. New Corn Bill introduced.
10. S. QUINQUAGESIMA SUNDAY. Shrove Sunday. Queen Victoria married, 1840. Lord Darnley murdered, 1567. Congreve born, 1670.
11. M. Sir William Sidney died, 1553. Descartes died, 1650. Fontenelle born, 1657. University College established, 1826.
12. T. Shrove Tuesday. Lady Jane Grey beheaded, 1554.
13. W. Ash Wednesday. First day of Lent. Revolution, 1688.
14. Th. St. Valentine. Old Candlemas Day. Capt. Cook killed, 1779. Jervis's Victory, 1797. Queen Catherine Howard executed, 1541.
15. F. National debt com. 1500. Sir J. Littleton died, 1590.
16. S. Melancthon born, 1497.
17. S. FIRST SUNDAY IN LENT. Michael Angelo died, 1564. Moliere died, 1763. Pestalozzi died, 1827.
18. M. Martin Luther died, 1546. Cassini born, 1677.
19. T. Galileo born, 1564. Ceylon taken by the British, 1815.
20. W. Bacon died, 1579. Voltaire born, 1694. Garrick born, 1716.
21. Th. James I. Scotland, assassinated, 1437.
22. F. Ember week. Washington born, 1732.
23. S. Sir Thomas Wyatt beh. 1555. Sir J. Reynolds died, 1792.
24. S. SECOND SUNDAY IN LENT. St. Matthias. Handel born, 1684. Duke of Cambridge born, 1774. Revolution in Paris, 1848.
25. M. Earl of Essex beh. 1601. Sir Christopher Wren died, 1723.
26. T. Bonaparte left Elba, 1815.
27. W. J. Evelyn died, 1706.
28. Th. Italy invaded by the Saracens, 1012.

March with the ancients ranked the first month of the year. It was named in honour of Mars, the supposed father of the founder of Rome. Our Anglo-Saxon ancestors called it Spring Month, and marriages were seldom solemnized, as they were counted likely to become inharmonious and unhappy. The 15th day, or the *ides* of March, was the *Parricidium*, the day on which Julius Cæsar was murdered in the senate-house by Brutus and Cassius. The same day was also the feast of *Anna Perenna*, the sister of Dido, who fled to Italy to Æneas.

### Ticketings, Pay Days, &c.

1. F. Carn Brea, S. Wheal Basset, and E. Pool pay and setting.
2. S. Par Consols, West Wheal Jewel, Dolcoath, and Stray Park pay and setting. Devon Consols and Wheal Mary pay.
3. S.
4. M. S. Wh. Francis acc. on the Mine. Fowey Consols Sampling.
5. T.
6. W. Devon Consols, &c. Sampling. County Court, Bodmin.
7. Th. Ticketing at Pool, North Roskear, North Pool, &c. County Court, St. Austell.
8. F. North Pool setting. County Court, Truro. West Caradon and Gonamena pay.
9. S. County Court, Falmouth. Par Consols and E. Crofty pay.
10. S.
11. M. North Roskear account on the Mine. Par Consols Sampling. County Court, Helston.
12. T. County Court, Penzance.
13. W. Consols, United, and other Mines Sampling.
14. Th. Ticketing at Redruth, Carn Brea, &c. County Court, Redruth.
15. F. Wheal Budnick pay. Levant tutwork pay.
16. S. Fowey Consols setting and pay.
17. S.
18. M. Fowey Consols Sampling. Trevisky account.
19. T. East Wheal Crofty accounts on the Mine.
20. W. North Pool, East Wheal Crofty, &c. Sampling. Great Consols account on the Mine.
21. Th. Ticketing at Truro, Devon Consols, and other Mines.
22. F. North Pool pay. United Mines account.
23. S. Seton, Trevisky, Consols, United, Wheal Comfort, Tywarnhayle, and Fowey Consols Mines pay. W. Buller and Agar.
24. S.
25. M. Par Consols Sampling.
26. T. Tresavean account on the Mine.
27. W. Carn Brea and other Mines Sampling.
28. Th. Ticketing at Truro, Consols, United, and other Mines.
29. F. East Crofty setting. Tin Croft pay.
30. S. Tresavean, Trethellan, South Francis, Grambler, West Seton, North Roskear, and Wheal Mary Mines pay. Condurrow pay and setting.
31. S.



## Anniversaries, &amp;c.

1. F. St. David.
2. S. St. Chad. Gesner died, 1788. Wesley died, 1791.
3. S. THIRD SUNDAY IN LENT. Sir W. Davenant born, 1606. Otway born, 1651. Prince Charles Stuart died, 1788.
4. M. Saladin died, 1193.
5. T. Corregio died, 1534. Dr. Arne, 1778. La Place died, 1827.
6. W. Michael Angelo born, 1474. Dr. Parr died, 1825.
7. Th. Perpetua. Bank of England suspended payment, 1790.
8. F. William III. died, 1702; succeeded by Queen Anne.
9. S. Rizzio assassinated, 1566. First issue of £1 notes, 1797.
10. S. FOURTH SUNDAY IN LENT. Playfair born, 1749. Benjamin West died, 1820. Reform Bill introduced, 1831.
11. M. Tasso born, 1544.
12. T. St. Gregory. Chelsea Hospital founded, 1682.
13. W. Georgium Sidus disc. 1781. Napoleon outlawed, 1815.
14. Th. Admiral Byng shot, 1757.
15. F. Julius Caesar assassinated, B.C. 44. London Bridge commenced, 1824.
16. S. First return of Columbus from America, 1493. Boileau born, 1635. Battle of Culloden, 1746. Gustavus III. assassinated, 1792.
17. S. FIFTH SUNDAY IN LENT. St. Patrick's Day. Massinger died, 1640. Bishop Burnet died, 1715.
18. M. Princess Louisa Caroline born, 1848. Edward, Saxon King, stabbed by Elfreda, 979. Sterne died, 1768. Horne Tooke died, 1812.
19. T. Le Brun born, 1739.
20. W. Sir I. Newton d. 1727. Ovid b. B.C. 43. Hen. IV. d. 1413.
21. Th. Benedict. Archbishop Cranmer burnt, 1556.
22. F. Cambridge Term ends. Trial of Lord Strafford, 1641.
23. S. Kotzebue assassinated, 1819. Weber died, 1829. National Gallery founded, 1824.
24. S. PALM SUNDAY. Oxford Term ends. Queen Elizabeth died, 1603. Chesterfield died, 1773.
25. M. Lady Day. Feast of Annunciation. London Charity Schools established, 1688. Duchess of Cambridge born, 1797.
26. T. Vanburgh died, 1726. Hutton died, 1797.
27. W. Robert Bruce crowned, 1306. Columbus discovered St. Domingo, 1492. King James I. died, 1625. Peace of Amiens, 1802.
28. Th. Maunday Thursday. Gunpowder first used in Europe, 1380.
29. F. Good Friday. Test Act passed, 1678. Swedenborg died, 1772.
30. S. Sicilian Vespers, 1282. Dr. Hunter died, 1783.
31. S. EASTER SUNDAY. Descartes born, 1596. Haydn born, 1732. Allied Sovereigns entered Paris, 1814.



By the Saxons called *Ostremonth*. The Dutch and Germans called it *Grasmonath*. Its name is derived from the Latin *aperio*, to open or disclose : the unfolding of buds and flowers by the influence of the genial warmth and moisture of spring.

### Ticketings, Pay Days, &c.

1. M. Fowey Consols Sampling.
2. T. South Wheal Basset account on the Mine.
3. W. Devon Consols and other Mines Sampling.
4. Th. Ticketing at Pool, North Pool, Seton, and other Mines.
5. F. Carn Brea, South Basset, and East Pool pay and setting.
6. S. Par Consols, West Jewel, Dolcoath, and Stray Park pay and setting.
7. S.
8. M. Wheal Seton account on the Mine. Par Consols Sampling. County Court, Helston.
9. T. County Court, Penzance.
10. W. Wheal Mary account on the Mine. United, Par, and South Caradon Sampling.
11. Th. Ticketing at Redruth, Carn Brea, and other Mines. County Court, Redruth.
12. F. Stray Park account. North Pool setting. West Caradon and Gonamena pay.
13. S. Par Consols pay.
14. S.
15. M. Condurrow account on the Mine. Fowey Consols Sampling.
16. T. East Pool account on the Mine.
17. W. North Roskear, North Pool, Seton, and other Mines Sampling.
18. Th. Ticketing at Redruth, Devon Consols, and other Mines.
19. F. Budnick pay. Levant tutwork pay.
20. S. Wheal Seton and Trevisky pay. Fowey Consols setting and pay. Consols, United, Comfort, Agar, and West Buller.
21. S.
22. M. Par Consols Sampling.
23. T.
24. W. Carn Brea and other Mines Sampling.
25. Th. Ticketing at Redruth, United, Par, South Caradon, and other Mines.
26. F. Tin Croft and N. Pool pay day. E. Wheal Crofty setting.
27. S. Tresavean, Trethellan, Fowey Consols, Trevisky, Tywarnhayle, and Wheal Mary pay. Condurrow pay and setting. West Seton, N. Roskear, S. Francis. Levant tribute pay. Vice-Warden's Court, Truro.
28. S.
29. M.
30. T. North Pool account on the Mine.

## Anniversaries, &amp;c.

1. M. Easter Monday. Napoleon married Marie Louise, 1810.
2. T. Battle of Copenhagen, 1801.
3. W. Napier died, 1617. Bishop Heber died, 1826.
4. Th. St. Ambrose. Oliver Goldsmith died, 1774.
5. F. Game certificate expires.
6. S. Old Lady Day. Socrates born, B.C. 468. Richard Cœur de Lion died, 1199. Albert Durer died, 1528. Napoleon's first abdication.
7. S. FIRST SUNDAY AFTER EASTER. Money first coined, B.C. 869. Francis Xavier born, 1506. South Sea Bubble commenced, 1720. Fire Insurance expires.
8. M. Lorenzo de' Medici died, 1492. Bacon died, 1626.
9. T. Edward IV. died, 1483.
10. W. Oxford Term ends. Catholic Emancipation Bill passed, 1829.
11. Th. George Canning born, 1770.
12. F. America discovered, 1492. Rodney's victory, 1782.
13. S. Otway died, 1685. Handel died, 1759.
14. S. SECOND SUNDAY AFTER EASTER. Battle of Barnet—Warwick died, 1471. Bishop Porteous died, 1809.
15. M. Easter Term begins.
16. T. Sir H. Sloane born, 1660. Buffon died, 1788. Fuzeli died, 1825.
17. W. Franklin died, 1790.
18. Th. American revolution, 1775.
19. F. Byron died, 1824. American war, 1775. Opie died, 1807.
20. S. Spanish Armada defeated, 1657. Lord Lovat executed, 1747.
21. S. THIRD SUNDAY AFTER EASTER. Heber born, 1783. Duke of Sussex died, 1843.
22. M. Henry VII. died, 1509. Cromwell deposed, 1659.
23. T. St. George's Day. Shakspeare born, 1564; died, 1616. Cervantes died, 1616. Nollekens died, 1823.
24. W. Sextus V. created Pope, 1583. Defoe died, 1731.
25. Th. St. Mark's Day. Princess Alice born, 1843. Tasso died, 1595. Oliver Cromwell born, 1599.
26. F. David Hume born, 1717.
27. S. Gibbon born, 1737. Bruce (traveller) died, 1794.
28. S. FOURTH SUNDAY AFTER EASTER. Chaucer died, 1434. Mutiny of the Bounty, 1789.
29. M. C. de St. Pierre died, 1743.
30. T. Farquhar died, 1707. Battle of Fontenoy, 1745. War with France, 1803. London University commenced, 1827.

The Hebrews named the month of their calendar which is synonymous with this, *Sivan*, from a catholic word signifying to rejoice. The Anglo-Saxons knew it as *Tri Milchi*, because their cows, stimulated by the fresh herbage, were so productive of milk as to enable the proprietors to bring them to the pail three times a day. The Romans offered sacrifices to Bona Dea, or *Maia*, on the 1st day of the month. It has been celebrated from the earliest ages as Nature's birthday, and will long continue its hold upon human affections.

### Ticketings, Pay Days, &c.

1. W. No Copper Ore Sampling this week.
2. Th. Ticketing at Camborne, North Roskear, North Pool, and other Mines.
3. F. Carn Brea, South Basset, and East Pool pay.
4. S. Par Consols, West Wheal Jewel, Dolcoath, and Stray Park pay and setting. Devon Consols.
5. S.
6. M. South Francis account on the Mines. Fowey Consols Sampling. County Court at Helston.
7. T. County Court, Penzance.
8. W. Devon Consols and other Mines Sampling. County Court, Redruth.
9. Th. Ticketing at Redruth, Carn Brea, and other Mines.
10. F. North Pool setting. County Court, St. Columb. West Caradon and Gonamena pay.
11. S. Par Consols pay.
12. S.
13. M. Wheal Jewel Annual Meeting in London. North Roskear account on the Mine. Par Consols Sampling.
14. T.
15. W. Consols account on the Mine. Consols, United, &c. Sampling.
16. Th. No Ticketing Copper Ore this week.
17. F. United Mines ac. on Mines. Budnick pay. Levant pay tutwork.
18. S. Consols, United, Comfort, and Wheal Seton pay. Fowey Consols setting and pay. West Buller.
19. S.
20. M. Fowey Consols Sampling. Trevisky account.
21. T. East Crofty account.
22. W. North Pool and other Mines Sampling.
23. Th. Ticketing at Truro, Devon Consols, and other Mines.
24. F. North Pool pay.
25. S. Fowey Consols and Trevisky pay. Agar, West Seton, Tywarnhayle.
26. S.
27. M. Par Consols Sampling.
28. T. Tresavean account on the Mine.
29. W. Carn Brea and other Mines Sampling.
30. Th. Ticketing at Truro, Consols, United, and other Mines.
31. F. Carn Brea pay. East Crofty setting. Tin Croft pay.

## Anniversaries, &amp;c.

1. W. St. Philip and St. James. Addison born, 1672. Dryden died, 1700. England and Scotland united, 1707. Duke of Wellington born, 1769.
2. Th. Leonardo da Vinci died, 1519.
3. F. Machiavelli born, 1469.
4. S. Henry IV. France, killed, 1610. Seringapatam taken, 1799.
5. S. ROGATION SUNDAY. Napoleon died, 1821. Fire at Ham-  
burgh, 1842.
6. M. St. John the Evangelist. Battle of Prague, 1757.
7. T. Glasgow University founded, 1795. Socrates died, B.C. 399.
8. W. Porteous born, 1731. Easter Term ends.
9. Th. Ascension Day. Holy Thursday. Louis XV. died, 1774.
10. F. Battle of Lodi, 1796.
11. S. Earl Chatham died, 1778. Spencer Percival assass. 1812.
12. S. SUNDAY AFTER ASCENSION. Earl Strafford beheaded, 1641.
13. M. Totness great Fair.
14. T. Battle of Tewkesbury, 1471. Vaccination first applied,  
1796. Grattan died, 1820.
15. W. Cuvier died, 1832.
16. Th. Sir William Petty born, 1623. Corn Bill passed, 1846.
17. F. Battle of Hexham, 1464. Radcliffe Library founded, 1737.  
Dr. Jenner born, 1749.
18. S. Siege of Malta raised by Turks, 1566. Napoleon made  
emperor, 1804. Oxford Term ends.
19. S. WHIT SUNDAY. Pentecost. St. Dunstan. Anne Boleyn  
beheaded, 1536. Boswell died, 1795.
20. M. Albert Durer born, 1471. Columbus died, 1506. York  
Minster burnt, 1840.
21. T. Dr. J. Warton died, 1790. First Railway Act passed, 1801.
22. W. Ember week. Landing of King John, 1199. Pope born,  
1688. Trinity Term begins.
23. Th. Battle of Ramilies, 1706. First stone of Southwark Bridge  
laid, 1815. Cambridge Term divides.
24. F. Queen Victoria born, 1819. Linnæus born, 1707.
25. S. Princess Helena born, 1846. Dr. Paley died, 1805.
26. S. TRINITY SUNDAY. St. Augustine. Venerable Bede died,  
735. Haydn died, 1809.
27. M. Dante born, 1265. Calvin died, 1564. Crown Prince of  
Hanover born, 1819.
28. T. Smeeton born, 1724. Pitt born, 1759. Fire at Quebec, 1845.
29. W. Charles II. restored, 1660. Sir Humphrey Davy died, 1829.
30. Th. Rubens died, 1640. Voltaire died, 1778.
31. F. Cruden b. 1700. Pope d. 1744. Eruption of Vesuvius, 1806.



June was the *Thamur* or *Tamuz* of the Hebrews after their escape from the Babylonish captivity. The meaning thereof signifies continuance and perfection; alluding probably to the almost uninterrupted daylight, maturation of fruit, &c.

### Ticketings, Pay Days, &c.

1. S. Devon Consols, Mary, Tresavean, Trethellan, Grambler, Wheal Jewel, South Francis, and North Roskear pay. Par Consols and Condurrow pay and setting.
2. S.
3. M. Fowey Consols Sampling.
4. T. South Basset account on the Mine.
5. W. Devon Consols and other Mines Sampling.
6. Th. Ticketing at Camborne, North Pool, and other Mines. County Court, St. Austell.
7. F. South Basset and East Pool pay. County Court, Truro. West Caradon and Gonamena pay.
8. S. Par Consols pay. Dolcoath and Stray Park pay and setting. County Court, Falmouth.
9. S.
10. M. Wheal Seton account on the Mine. Par Consols Sampling.
11. T. County Court, Penzance.
12. W. United, South Caradon, Wheal Mary account, &c.
13. Th. Ticketing at Redruth, Carn Brea, and other Mines.
14. F. Stray Park account. North Pool setting.
15. S. Fowey Consols setting and pay.
16. S.
17. M. Condurrow account on the Mine. Fowey Consols Sampling.
18. T. East Pool and Fowey Consols account on the Mine.
19. W. North Roskear, Consols, North Pool, and other Mines Sampling.
20. Th. Ticketing at Redruth, Devon Consols, and other Mines.
21. F. Budnick pay. Levant tutwork pay.
22. S. Wheal Seton, Trevisky, Agar, Consols, United, Comfort, West Buller, and Fowey Consols pay.
23. S.
24. M. Par Consols Sampling.
25. T.
26. W. Carn Brea and other Mines Sampling.
27. Th. Ticketing at Truro, United, South Caradon, and other Mines.
28. F. Tin Croft and North Pool pay. East Crofty setting.
29. S. Tresavean, Trethellan, Grambler, North Roskear, South Francis, West Seton, Tywarnhayle, and Wheal Mary pay. Condurrow pay and setting. Levant tribute pay.
30. S.



## Anniversaries, &amp;c.

1. S. St. Nicomede. Marlow died, 1593. Poussin born, 1594. Lord Howe's victory, 1794.
2. S. FIRST SUNDAY AFTER TRINITY. Riots in London, 1780.
3. M. Globes invented, B.C. 603. Peace signed at Paris, 1814.
4. T. Bishop Boniface. George III. born, 1738.
5. W. Henry II. died, 1189. Corneille born, 1606. A. Smith born, 1723. King of Hanover born, 1771.
6. Th. Calvin born, 1509. Ariosto died, 1553. Lord Anson died, 1762.
7. F. Corpus Christi Day, 1376. Royal Exchange founded, 1566. Reform Bill passed, 1832.
8. S. Bishops sent to the Tower, 1688.
9. S. SECOND SUNDAY AFTER TRINITY. Edward the Black Prince died, 1376. Habeas Corpus Act passed, 1641. Liverpool Old Dock made, 1699.
10. M. London Hospital founded, 1752.
11. T. St. Barnabas. Roger Bacon died, 1294.
12. W. Trinity Term ends. W. Collins died, 1759.
13. Th. Corsica seized by the French, 1769.
14. F. Battle of Marengo, 1800.
15. S. Magna Charta signed, 1215. Wat Tyler killed, 1381. Writings of Luther condemned, 1520. First Stone of London Bridge laid, 1825.
16. S. THIRD SUNDAY AFTER TRINITY. Duke of Marlborough died, 1722.
17. M. St. Alban. The Seven Bishops acquitted, 1788. Wesley born, 1703.
18. T. Battle of Waterloo, 1815. Waterloo Bridge opened, 1817.
19. W. Sir Joshua Banks died, 1820.
20. Th. William IV. died, 1837. Queen Victoria's accession.
21. F. Queen Victoria proclaimed, 1837. King Edward III. died, 1377. Inigo Jones died, 1652. Longest Day. First Stone of St. Paul's laid by Sir Christopher Wren, 1675.
22. S. Battle of Bothwell Brig, 1679. Summer commences.
23. S. FOURTH SUNDAY AFTER TRINITY. Stamp Duty instituted, 1694. Akenside died, 1770.
24. M. Midsummer Day. Nat. of St. John Baptist. John Churchill, Duke of Marlborough, b. 1650. Battle of Bannockburn, 1314.
25. T. St. James.
26. W. Richard III. made king, 1483. George IV. died, 1830.
27. Th. Dr. Dodd hanged for forgery, 1777.
28. F. Queen Victoria crowned, 1838. Rubens born, 1577.
29. S. St. Peter. Julian the Apostate died, 363.
30. S. FIFTH SUNDAY AFTER TRINITY. Greenwich Hospital founded, 1636. Parker hanged at the Nore, 1791.

The fifth month of the Roman calendar: received, in consequence, the name of *Quintilis*, to denote its numerical position. It was sacred to Jupiter, and had, in the Alban calendar, 36 days. Romulus took from it 5, Numa reduced it to 30, but Julius Cæsar enlarged it to 31. In honour of this conqueror, Mark Antony changed its name from *Quintilis* to *Julius*,—hence our July. Our Saxon forefathers, who named their months from certain appearances or events, denominated this *Heymonath*, being their hay harvest.

### Ticketings, Pay Days, &c.

1. M. South Francis acc. on the Mine. Fowey Consols Sampling.
2. T. North Pool account on the Mine.
3. W. Devon Consols and other Mines Sampling.
4. Th. Ticketing at Camborne, North Roskear, Consols, North Pool, and other Mines.
5. F. Carn Brea, South Basset, and East Pool pay and setting. County Court, Truro.
6. S. Par Consols, W. Jewel, Dolcoath, Devon Consols and Stray Park pay and setting. County Court, Falmouth.
7. S.
8. M. County Court, Helston. North Roskear account on the Mine. Par Consols Sampling.
9. T. County Court, Penzance.
10. W. Consols, United, &c. Sampling. County Court, Redruth.
11. Th. Ticketing at Redruth, Carn Brea, and other Mines.
12. F. North Pool setting. County Court, St. Columb. West Caradon and Gonamena pay.
13. S. Par Consols pay.
14. S.
15. M. Fowey Consols Sampling.
16. T.
17. W. N. Pool, Seton, &c. Sampling. Gt. Consols ac. on the Mine.
18. Th. Ticketing at Truro, Devon Consols, and other Mines.
19. F. Budnick pay. United Mines account on the Mine.
20. S. Wheal Seton, Trevisky, Great Consols, West Buller, Comfort, Agar, and United Mines pay. Fowey Consols setting and pay.
21. S.
22. M. Trevisky and Barrier account. Par Consols Sampling.
23. T. East Wheal Crofty account on the Mine.
24. W. Carn Brea and other Mines Sampling.
25. Th. Ticketing at Truro, Consols, United, and other Mines.
26. F. North Pool pay. East Crofty setting.
27. S. Tresavean, Trethellan, N. Roskear, Grambler, Fowey Consols, Tywarnhayle, West Seton, and Wheal Mary pay. Condurrow pay and setting.
28. S.
29. M.
30. T. Tresavean and Trethellan accounts on the Mines.
31. W. No Copper Ore Sampling this week.

## Anniversaries, &amp;c.

1. M. Battle of the Boyne, 1690.
2. T. Rousseau died, 1778. Hungerford Market opened.
3. W. Dog Days begin. Cranmer born, 1489.
4. Th. St. Martin. Transfiguration. American Independence proc. 1776.
5. F. Dividends due. Cambridge Term ends. Peter the Hermit died, 1115.
6. S. Old Midsummer Day. Oxford and Trinity Terms end. Edward VI. died, 1553. Henry II. died, 1189.
7. S. SIXTH SUNDAY AFTER TRINITY. Edward I. died, 1307. Sir Thomas More beheaded, 1535. Sheridan d. 1816.
8. M. La Fontaine born, 1621. Burke died, 1797.
9. T. Fire Insurance expires.
10. W. Demosthenes born, B.C. 382. First Bible printed in Scotland, 1579. Sir W. Blackstone born, 1723.
11. Th. D'Anville born, 1697. Lalande born, 1732.
12. F. Julius Cæsar born, B.C. 100. Erasmus died, 1536.
13. S. Napoleon surrendered to the *Bellerophon*, 1815.
14. S. SEVENTH SUNDAY AFTER TRINITY. Bastille destroyed, 1789. Baroness De Staël died, 1817.
15. M. St. Swithin.
16. T. Sir Joshua Reynolds born, 1723. La Voissier born, 1743.
17. W. Dr. Watts born, 1674. A. Smith died, 1790.
18. Th. Sun due west at 5 o'clock.
19. F. Petrarch died, 1374. Spanish Armada arrived, 1588. Bodleian Library founded, 1610.
20. S. St. Margaret. Petrarch born, 1304.
21. S. EIGHTH SUNDAY AFTER TRINITY. Battle of Shrewsbury, 1403. Lord W. Russell beheaded, 1683. Burns d. 1796.
22. M. St. Mary Magdalene. Battle of Salamanca.
23. T. First English newspaper printed, 1538. Gibraltar taken, 1704.
24. W. Lupus, Bishop of Troyes, 426. Insurances began, 1696.
25. Th. St. James or Apple-blessing Day. Marriage of Philip and Mary, 1554. Duchess of Cambridge born, 1799.
26. F. St. Anne.
27. S. Revolution in Paris, 1830. Almanack Duty repealed, 1834. Bank of England chartered, 1694.
28. S. NINTH SUNDAY AFTER TRINITY. Siege of Derry ended, 1689. Robespierre guillotined, 1794. Battle of the Pyrenees, 1813.
29. M. St. Martha. Spanish Armada destroyed, 1588.
30. T. Greenwich Hospital founded, 1696. Penn died, 1718.
31. W. Ignatius Loyola, 1556. Thomas Gray died, 1771.

This month derived its name from Augustus, the Roman emperor. It was called *Sextilis*, or the sixth month, in the Alban calendar, and only 28 days assigned to it. Romulus added 2, and Augustus 1; the whole of which have been since retained. The Anglo-Saxons called it *Barnmonath*, this being the period when their barns were commonly filled, or *Woodmonath*, clothing-month, the fields being then clothed with corn; just as the Romans dedicated this month to Ceres, the goddess of harvest, a period of joy and gladness to all nations.

### Ticketings, Pay Days, &c.

1. Th. Ticketing at Camborne, North Pool, Seton, &c.
2. F. Carn Brea, South Basset, Tin Croft, and East Pool pay.
3. S. West Jewel and Devon Consols pay. Par Consols, Dolcoath, and Stray Park pay and setting.
4. S.
5. M. Fowey Consols Sampling.
6. T. South Wheal Basset account on the Mine.
7. W. Devon Consols and other Mines Sampling. County Court, Bodmin.
8. Th. Ticketing at Redruth, Carn Brea, and other Mines.
9. F. Stray Park account. North Pool setting. County Court, Truro. West Caradon and Gonamena pay.
10. S. County Court, Falmouth. Par Consols pay.
11. S.
12. M. Wheal Seton account on the Mine. Par Consols Sampling. County Court, Helston.
13. T. County Court, Penzance.
14. W. United, Par, Caradon, and other Mines Sampling. County Court, Redruth.
15. Th. No Copper Ore Ticketing this week.
16. F. Budnick pay. County Court, St. Columb.
17. S. Fowey Consols setting and pay.
18. S.
19. M. Condurrow acc. on the Mine. Fowey Consols Sampling.
20. T. East Pool account on the Mine.
21. W. North Roskear, North Pool, and other Mines Sampling.
22. Th. Ticketing at Redruth, Devon Consols, and other Mines.
23. F. North Pool pay.
24. S. Trevisky, Seton, Tywarnhayle, Consols, United, Comfort, Agar, West Buller, and Fowey Consols pay.
25. S.
26. M. Par Consols Sampling.
27. T. North Pool account on the Mine.
28. W. Carn Brea and other Mines Sampling.
29. Th. Ticketing at Redruth, United, Par, and other Mines.
30. F. East Crofty setting. Tin Croft pay.
31. S. Tresavean, Trethellan, N. Roskear, Grambler, West Seton, and Wheal Mary pay. Condurrow pay and setting. Levant tribute pay.



## Anniversaries, &amp;c.

1. Th. Lammas. Queen Anne died, 1714. Regent's Canal opened, 1820. Slavery abolished, 1837. Battle of the Nile, 1798.
2. F. William Rufus slain, 1100. Battle of Blenheim, 1704.
3. S. Columbus's first voyage, 1492. Arkwright died, 1792. Bank of England commenced.
4. S. TENTH SUNDAY AFTER TRINITY. Calais taken by Edward III. 1347. East-India Docks opened.
5. M. Earl Howe died, 1799.
6. T. Transfiguration. Prince Alfred born, 1844. Ben Jonson died, 1637.
7. W. Fenelon born, 1561. Grand eruption of Vesuvius, 1779. Napoleon sailed for St. Helena, 1815. Queen Caroline died, 1821.
8. Th. Canning died, 1827.
9. F. Dryden b. 1631. First mail-coach established, 1785.
10. S. St. Lawrence. Battle of St. Quentin, 1557. Greenwich Observatory founded, 1675.
11. S. ELEVENTH SUNDAY AFTER TRINITY. Dog-days end.
12. M. George IV. born, 1762.
13. T. Old Lammas Day.
14. W. Printing invented, 1441. Thomas Sheridan died, 1785.
15. Th. Assumption Day. Admiral Blake born, 1599. Napoleon born at Ajaccio, 1769. Sir W. Scott born, 1771.
16. F. Andrew Marvel died, 1678.
17. S. Admiral Blake died, 1657. Frederick the Great died, 1786. Duchess of Kent born, 1786.
18. S. TWELFTH SUNDAY AFTER TRINITY. Beattie died, 1803.
19. M. Royal George sunk, 1782.
20. T. Bloomfield died, 1823.
21. W. Muslin first made, 1781.
22. Th. Battle of Bosworth Field, 1485. Oliver Comwell mar. 1620.
23. F. Wallace beheaded, 1305. Duke of Buckingham killed, 1628. Stamps on newspapers, 1713. Cuvier born, 1769. American War, 1775.
24. S. St. Bartholomew. French massacre, 1572.
25. S. THIRTEENTH SUNDAY AFTER TRINITY. Battle of Cressy, 1346. Goethe, 1749. James Watt died, 1819. Sir W. Herschel died, 1822.
26. M. Prince Albert born, 1819. Lopez de Vega died, 1635.
27. T. Liverpool incorporated, 1207. Algiers taken, 1816.
28. W. St. Augustine. Eruption of Vesuvius, 1834.
29. Th. St. John the Baptist beheaded. John Locke born, 1632. Sir W. Congreve died, 1828.
30. F. Jerusalem destroyed, A.D. 70. Paley born, 1743.
31. S. Henry V. died, 1422. Bunyan died, 1688. British Museum closes.



In the Latin and Roman calendar this was the seventh month; *septem*, seven, and *imber*, a shower of rain. It had only 16 days assigned to it in the Alban calendar, increased to 30 by Romulus, to 31 by Julius Cæsar; but Augustus reduced it to 30 again. The ancient Saxons called it *Berstmonath*, or barley month.

### Ticketings, Pay Days, &c.

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1. S.
2. M. S. Francis acc. on the Mine. Fowey Consols Sampling.
3. T.
4. W. Devon Consols and other Mines Sampling.
5. Th. Ticketing at Pool, N. Roskear, Consols, N. Pool, &c.
6. F. Carn Brea, South Basset, and East Pool pay day. County Court, Truro. West Caradon and Gonamena pay.
7. S. Devon Consols and W. Jewel pay. County Court, Falmouth. Par Consols, Dolcoath, and Stray Park pay and setting.
8. S.
9. M. North Roskear account. Par Consols Sampling. County Court, Helston.
10. T. County Court, Penzance.
11. W. Consols, United, and other Mines Sampling. County Court, Redruth.
12. Th. Ticketing at Redruth, Carn Brea, and other Mines.
13. F. North Pool setting. County Court, St. Columb.
14. S. Par Consols pay.
15. S.
16. M. Trevisky and Barrier account. Fowey Consols Sampling.
17. T.
18. W. Great Consols account on the Mines. North Pool and other Mines Sampling.
19. Th. Ticketing at Truro. Devon Consols and other Mines.
20. F. United Mines account on the Mines. Budnick pay. Levant tutwork pay.
21. S. Consols, United, Seton, and Trevisky pay. Fowey Consols, Comfort, Wost Ruller, and Agar setting and pay.
22. S.
23. M. Par Consols Sampling.
24. T. Tresavean, Trethellan, and East Wheal Crofty account on the Mine.
25. W. Carn Brea and other Mines Sampling.
26. Th. Ticketing at Truro, Consols, United, and other Mines.
27. F. North Pool pay. East Crofty setting. Tin Croft pay.
28. S. Tresavean, Trethellan, N. Roskear, Grambler, Fowey Consols, and Wh. Mary pay. Condurrow, Tywarnhayle, and West Seton pay and setting.
29. S.
30. M.

## Anniversaries, &amp;c.

1. **S.** FOURTEENTH SUNDAY AFTER TRINITY. Louis XIV. died, 1715. Copenhagen surrendered, 1807. St. Giles.
2. **M.** Style altered, 1752. London burnt, 1666; fire lasted 3 days, destroyed 87 churches, 13,200 houses, and £10,000,000 property.
3. **T.** Cromwell, victory at Dunbar; victory at Worcester, 1653; died, 1658. Sir E. Coke died, 1634.
4. **W.** Home died, 1808.
5. **Th.** First American Congress, 1774. Malta taken, 1800.
6. **F.** Rebellion begun, 1715.
7. **S.** Eunuchus. Queen Elizabeth b. 1533. Buffon b. 1707.
8. **S.** FIFTEENTH SUNDAY AFTER TRINITY, Nativity. William the Conqueror died, 1087. Ariosto born, 1474.
9. **M.** Battle of Flodden Field, 1643. British Museum re-opens, 10 to 4.
10. **T.** Paper first made in England, 1588. Mungo Park d. 1771.
11. **W.** Tea first imported, 1391.
12. **Th.** Siege of Vienna, 1683. Blucher died, 1819.
13. **F.** General Wolfe died, 1759. Fox died, 1806.
14. **S.** Holyrood Cross.
15. **S.** SIXTEENTH SUNDAY AFTER TRINITY. Liverpool and Manchester Railway opened, 1830.
16. **M.** Moscow burnt, 1812.
17. **T.** Lambert. Queen of Portugal installed, 1834. London and Birmingham Railway opened, 1838.
18. **W.** Ember Week. Dr. Johnson born, 1709. Sterne died, 1768.
19. **Th.** Battle of Poitiers, 1356. First English book printed, 1471.
20. **F.** Edward II. murdered, 1327. Battle of Newbury, 1643.
21. **S.** St. Matthew. Sir W. Scott died, 1832.
22. **S.** SEVENTEENTH SUNDAY AFTER TRINITY. Charles V. died, 1558. George III. crowned, 1761. New Post Office opened, 1829.
23. **M.** Butler died, 1680. Autumn Quarter commences; day and night equal.
24. **T.** Don Pedro died, 1834. Sun rises due east.
25. **W.** Dr. Adam Clarke died, 1832.
26. **Th.** St. Cyprian. William II. crowned, 1087. Collingwood born, 1748. Werner born, 1750.
27. **F.** Fire at Devonport Dockyard, 1840.
28. **S.** Richard II. resigns, 1399. South Sea Bubble burst, 1720.
29. **S.** EIGHTEENTH SUNDAY AFTER TRINITY. Michaelmas Day. Nelson born, 1758.
30. **M.** St. Jerome. Queen Mary crowned, 1553. Whitfield died, 1770.

This, by our Saxon forefathers, was called *Wynmonath*, or wine month, and was the eighth of the Alban calendar, in which it had 39 days. Its name is derived from the Latin *octo*, eight, and *imber*, a shower of rain. Romulus reduced it to 31 days, Numa to 29; Julius and Augustus each added one, and this number continues.

### Ticketings, Pay Days, &c.

1. T. South Basset account on the Mine.
2. W. Devon Consols and other Mines Sampling. Treleigh annual meeting in London.
3. Th. Ticketing at Pool, North Pool, Seton, and other Mines. County Court, Bodmin.
4. F. Carn Brea, South Basset, and East Pool pay and setting. County Court, Truro.
5. S. Devon Consols and W. Jewel pay. County Court, Falmouth. Par Consols, Dolcoath, and Stray Park pay and setting.
6. S.
7. M. Wheal Seton account on the Mine. Par Consols Sampling. County Court, Helston.
8. T. County Court, Penzance.
9. W. United, Par, S. Caradon, and other Mines Sampling.
10. Th. Ticketing at Redruth, Carn Brea, and other Mines. County Court, Redruth.
11. F. Stray Park account. North Pool setting. County Court, St. Columb. West Caradon and Gonamena pay.
12. S. Par Consols pay.
13. S.
14. M. Condurrow acc. on the Mine. Fowey Consols Sampling.
15. T. East Pool and Fowey Consols account on the Mine.
16. W. North Roskear, North Pool, and Seton Sampling.
17. Th. Ticketing at Redruth, Devon Consols, and other Mines.
18. F. Budnick pay. Levant tutwork pay.
19. S. Trevisky and Seton pay. Fowey Consols, Great Consols, Agar, West Buller, United, and Comfort setting and pay.
20. S.
21. M. Par Consols Sampling.
22. T.
23. W. Carn Brea and other Mines Sampling.
24. Th. Ticketing at Truro, United Mines, Par, and other Mines.
25. F. North Pool pay. East Crofty setting.
26. S. Tywarnhayle, Tresavean, Trethellan, Grambler, North Roskear, Fowey Consols, Wheal Mary, and Condurrow pay. West Seton and Levant tribute pay.
27. S.
28. M.
29. T. North Pool account on the Mines.
30. W. No Copper Ore Sampling this week.
31. Th. Ticketing at Pool, N. Roskear, N. Pool, Seton, &c.

## Anniversaries, &amp;c.

1. T. Bishop Percy died, 1811. London University opened, 1828.
2. W. Major André hanged as a spy in New York, 1780.
3. Th. Barclay died, 1690. Archbishop Tillotson born, 1730. King's College opened, 1831.
4. F. Bible printed in England, 1535. Bishop Heber died, 1833.
5. S. Old Parr died, 1635. Walpole born, 1717.
6. S. NINETEENTH SUNDAY AFTER TRINITY. Louis Philippe born, 1773. Peace proclaimed with America, 1783.
7. M. William I. of Holland abdicated, 1840.
8. T. Gun Cotton patented, 1846. Eddystone Lighthouse opened, 1759.
9. W. St. Denis, patron saint of France.
10. Th. B. West born, 1738. Oxford and Cambridge Term begins.
11. F. Old Michaelmas Day. Lord Duncan's victory, 1797.
12. S. America discovered, 1492.
13. S. TWENTIETH SUNDAY AFTER TRINITY. Murat shot, 1815. Canova died, 1822.
14. M. Battle of Hastings, 1066. Penn born, 1644. Battle of Jena, 1806. China Trade opened, 1833.
15. T. Virgil born, B.C. 70. Fire Insurance expires.
16. W. Sir P. Sidney died, 1586. Battle of Leipsic, 1813. Marie Antoinette guillotined, 1793. Kosciusko died, 1817.
17. Th. Etheldreda. Napoleon arrived at St. Helena, 1815.
18. F. St. Luke. King John died, 1216.
19. S. Kneller died, 1723. Swift died, 1745.
20. S. TWENTY-FIRST SUNDAY AFTER TRINITY. Sir Christopher Wren born, 1632. Battle of Navarino, 1827.
21. M. Smollet died, 1771. Battle of Trafalgar, Nelson d. 1805.
22. T. Sir Cloudesley Shovell wrecked, 1707.
23. W. Royal Exchange founded, 1667.
24. Th. Chaucer died, 1400. Butler, 1680. First British Parliament, 1707.
25. F. St. Crispin. King Stephen died, 1154. Battle of Agincourt, 1415. George II. died, 1760.
26. S. Hogarth died, 1764. Riots in Bristol, 1831.
27. S. TWENTY-SECOND SUNDAY AFTER TRINITY. Capt. Cook born, 1728. Napoleon entered Berlin, 1806.
28. M. St. Simon and St. Jude. King Alfred died, 901. Erasmus born, 1467. Locke died, 1704.
29. T. Sir W. Raleigh beheaded, 1618. Sheridan born, 1751.
30. W. Alfred the Great died, 900. First Stone of Blackfriars Bridge laid, 1760. Tower Armory burnt, 1841.
31. Th. Hallowmas Eve. Evelyn born, 1620.



The early Saxon inhabitants of England called this *Blottmonath*, or slaughter-month, because in those primitive days winter seed was so scarce in England that it was usual to kill and salt the greater part of their winter meat in this month. Its name is derived from the Latin *novem*, nine, and *imber*, a shower. It was so called in the Alban calendar, and has preserved its name both in our island and on the continent.

### Ticketings, Pay Days, &c.

1. F. Carn Brea, South Basset, Tin Croft, and East Pool pay day.
2. S. Par Consols, Stray Park, Dolcoath, Devon Consols, and West Jewel pay and setting.
3. S.
4. M. S. Francis account on the Mine. Fowey Consols Sampling.
5. T.
6. W. Devon Consols and other Mines Sampling. County Court, Bodmin.
7. Th. Ticketing at Redruth, Carn Brea, and other Mines.
8. F. North Pool setting. County Court, Truro. West Caradon and Gonamena pay.
9. S. County Court, Falmouth. Par Consols pay.
10. S.
11. M. County Court, Helston. Par Consols Sampling.
12. T. County Court, Penzance.
13. W. Consols, United, &c. Sampling. County Court, Redruth.
14. Th. No Copper Ore Ticketing this week.
15. F. County Court, St. Columb. Budnick pay. Levant tut-work pay.
16. S. Fowey Consols setting and pay.
17. S.
18. M. Trevisky and Barrier account. Fowey Consols Sampling.
19. T. East Wheal Crofty account on the Mine.
20. W. North Pool, Seton, &c. Sampling. Great Consols account on the Mine.
21. Th. Ticketing at Truro, Devon Consols, and other Mines.
22. F. N. Pool pay. United Mines account on the Mines.
23. S. Consols, United, Fowey Consols, Wheal Seton, Agar, Comfort, West Buller, and Trevisky pay.
24. S.
25. M. Par Consols Sampling.
26. T.
27. W. Carn Brea, &c. Sampling.
28. Th. Ticketing at Truro, Consols, United, &c.
29. F. East Wheal Crofty setting. Tin Croft pay.
30. S. Tresavean, Trethellan, Grambler, Condurrow, Tywarnhayle, West Seton, North Roskear, and Wheal Mary pay.



## Anniversaries, &amp;c.

1. F. All Saints. Hallowmas. Earthquake at Lisbon, 1755.
2. S. All Souls. Michaelmas Term begins.
3. S. TWENTY-THIRD SUNDAY AFTER TRINITY. Drake returned from first voyage round the world, 1580. Long Parliament opened, 1641.
4. M. King William landed, 1688. St. Petersburg Academy of Fine Arts instituted, 1764. Montgomery born, 1771.
5. T. Gunpowder Plot, 1605. Hogarth died, 1764. Churchill died, 1784. Battle of Genappe, 1792.
6. W. Leonard. Princess Charlotte died, 1817.
7. Th. Battle of Prague, 1660. First Newspaper printed at Oxford, 1665.
8. F. Cardinal Ximenes died, 1517. Cortez entered Mexico, 1519. Milton died, 1674.
9. S. Prince of Wales and Duke of Cornwall born, 1841. Lord Mayor's Day.
10. S. TWENTY-FOURTH SUNDAY AFTER TRINITY. Luther born, 1483.
11. M. St. Martin.
12. T. Cambridge Term divides. Canute d. 1036. Baxter b. 1615.
13. W. Britius. Curran died, 1817.
14. Th. Academy of Arts established at Rome, 1593. Bruce discovered source of the Nile, 1770.
15. F. Lavater born, 1741. War commenced with America, 1774.
16. S. Henry III. died, 1272. East-India House built, 1786.
17. S. TWENTY-FIFTH SUNDAY AFTER TRINITY. St. Hugh. Le Sage died, 1747. Opening Westminster Bridge, 1750.
18. M. Cape of Good Hope taken, 1497. Wilkie born, 1785.
19. T. Charles I. born, 1599. Blackfriars Bridge opened, 1776.
20. W. Lord Hawke's Victory, 1759.
21. Th. Princess Royal born, 1840.
22. F. St. Cecilia. Committee of Fine Arts issued, 1841.
23. S. St. Clement. Old Martinmas Day.
24. S. TWENTY-SIXTH SUNDAY AFTER TRINITY. Knox died, 1572. Sterne born, 1713. Peace with America, 1814.
25. M. St. Catherine. Michaelmas Term ends. Dr. Watts d. 1748.
26. T. Great Storm, 1703. Cowper born, 1731.
27. W. Post Office established, 1560. Capt. Cook born, 1728.
28. Th. Cardinal Wolsey died, 1530.
29. F. Goldsmith born, 1731. Polish Revolution, 1830.
30. S. St. Andrew's. Swift born, 1667. Sir Christopher Wren, President of the Royal Society, 1681.

So named by the Romans, being the tenth or last month into which they divided the year. It was, by the Saxons, denominated *Wintermonath*, but after Christianity, they piously gave it the name of *Holy-month*.

### Ticketings, Pay Days, &c.

1. S.
2. M. Fowey Consols Sampling.
3. T. South Basset account on the Mine.
4. W. Devon Consols, &c. Sampling. County Court, Bodmin.
5. Th. Ticketing at Redruth, North Pool, Seton, &c.
6. F. Carn Brea, South Basset, and East Pool pay and setting. County Court, Truro.
7. S. Par Consols, Dolcoath, Stray Park, Devon Consols, and West Jewel pay and setting. County Court, Falmouth.
8. S.
9. M. Wheal Seton account on the Mine. Par Consols Sampling. County Court, Helston.
10. T. County Court, Penzance.
11. W. United, &c. Sampling. County Court, Redruth. Wheal Mary account on the Mine.
12. Th. Ticketing at Redruth, Carn Brea, and other Mines.
13. F. Stray Park account. North Pool setting. County Court, St. Columb. West Caradon and Gonamena pay.
14. S. Par Consols pay.
15. S.
16. M. Condurrow acc. on the Mine. Fowey Consols Sampling.
17. T. East Pool account on the Mine.
18. W. North Pool and other Mines Sampling.
19. Th. Ticketing at Redruth, Devon Consols, and other Mines.
20. F. Budnick pay. Levant tutwork pay.
21. S. Consols, United, Comfort, and Seton pay. Fowey Consols, Agar, West Buller, and Trevisky setting and pay.
22. S.
23. M. Par Consols Sampling.
24. T. Carn Brea and other Mines Sampling.
25. W. Christmas Day.
26. Th. Ticketing at Redruth, United, and other Mines.
27. F. East Wheal Crofty setting. North Pool pay.
28. S. Condurrow, Wheal Mary, Fowey Consols, Tresavean, Trethellan, West Seton, Levant tribute, North Roskear, and Grambler pay.
29. S.
30. M.
31. T. North Pool account on the Mine.

## Anniversaries, &amp;c.

1. **S.** ADVENT SUNDAY. Henry I. died, 1135. Pope Leo X. died, 1521. Alexander I. died, 1825. Art Union chartered, 1846.
2. **M.** St. Paul's finished, 1710. Napoleon created emperor, 1804. Battle of Austerlitz, 1805. Queen Adelaide died, 1849.
3. **T.** James II. abdicated, 1688. Belzoni died, 1823.
4. **W.** Woollen cloth made, 1331. Cardinal Richelieu died, 1642.
5. **Th.** Mozart died, 1792.
6. **F.** Nicholas.
7. **S.** Sydney beheaded, 1683. Ney shot, 1815.
8. **S.** SECOND SUNDAY IN ADVENT. Milton born, 1608. Flaxman died, 1826.
9. **M.** Washington died, 1799.
10. **T.** Hogarth born, 1697. Royal Academy established, 1768.
11. **W.** Charles XII. killed, 1718. John Gay died, 1732.
12. **Th.** Lord Hood born, 1724. Darwin born, 1732. C. Cibber died, 1757.
13. **F.** S. Johnson died, 1784.
14. **S.** I. Walton died, 1683. Washington died, 1799.
15. **S.** THIRD SUNDAY IN ADVENT. Calico introduced into Great Britain, 1772.
16. **M.** Selden born, 1584. Cromwell declared Protector, 1653. Whitfield born, 1714. Cambridge Term ends.
17. **T.** Sir H. Davy born, 1778. Oxford Term ends.
18. **W.** Ember Week. Thos. Guy died, 1724. Bolivar died, 1830.
19. **Th.** Rubens born, 1577. Riots at Manchester, 1792.
20. **F.** Thomas Gray born, 1716. War declared against Holland, 1780. Dulwich Gallery founded, 1810.
21. **S.** St. Thomas. Shortest Day.
22. **S.** FOURTH SUNDAY IN ADVENT. Banks (Sculptor) b. 1735.
23. **M.** James II. fled, 1688. Arkwright born, 1732.
24. **T.** Bishop Warburton born, 1698.
25. **W.** Christmas Day. Sir I. Newton born, 1642.
26. **Th.** St. Stephen. French landed in Bantry Bay, 1796.
27. **F.** St. John Evangelist. Greenwich Railway opened, 1829.
28. **S.** Innocents. Queen Mary II. died, 1694. Wilkes d. 1797.
29. **S.** FIRST SUNDAY AFTER CHRISTMAS. Lord Stafford beheaded, 1680. Wycliffe died, 1384.
30. **M.** Royal Society established. Great Frost on the continent, 1794. Marmontel died, 1799.
31. **T.** Boerhaave born, 1668.

Days.	JANUARY.				FEBRUARY.				MARCH.				APRIL.				MAY.				JUNE.			
	SUN		MOON		SUN		MOON		SUN		MOON		SUN		MOON		SUN		MOON		SUN		MOON	
	Rises	H. M.	Sets.	H. M.	Rises	H. M.	Sets.	H. M.	Rises	H. M.	Sets.	H. M.	Rises	H. M.	Sets.	H. M.	Rises	H. M.	Sets.	H. M.	Rises	H. M.	Sets.	H. M.
1	8 8	4	0	8 9	10 1	7 41	4 48	9 51	5 37	9 33	8 16	5 38	6 31	11 43	8 8	4 35	7 21	8 2	3 51	8 4	0 5	9 36		
2	8 8	4	1	9 25	10 35	7 40	4 49	11 53	5 39	10 43	8 45	5 36	6 33	Morn	8 45	4 33	7 23	0 15	8 53	3 51	8 5	0 34	10 40	
3	8 8	4	2	10 40	11 2	7 38	4 50	Morn	5 44	11 51	9 11	5 34	6 35	0 11	9 25	4 31	7 24	0 56	9 47	3 50	8 6	0 58	11 44	
4	8 8	4	3	11 50	11 28	7 36	4 52	1 11	5 43	Morn	9 40	5 32	6 37	1 33	10 11	4 29	7 26	1 33	10 46	3 50	8 7	1 22	Aft.	
5	8 8	4	4	Morn	11 53	7 34	4 54	2 51	5 45	0 54	10 12	5 29	6 38	2 19	11 4	4 28	7 27	2 3	11 49	3 49	8 8	1 45	2 3	
6	8 8	4	5	0	Aft.	7 32	4 56	3 8	5 46	1 55	10 50	5 27	6 39	2 58	Aft.	4 26	7 29	2 30	Aft.	3 48	8 9	2 8	3 13	
7	8 7	4	7	2 7	0 40	7 30	4 57	4 5	5 48	2 50	11 33	5 24	6 41	3 31	1 2	4 24	7 30	2 55	2 3	3 47	8 10	2 33	4 28	
8	8 6	4	8	3 14	1 37	7 29	4 59	4 56	5 49	3 39	Aft.	5 22	6 43	4 2	2 7	4 22	7 32	3 18	3 12	3 47	8 11	3 1	5 45	
9	8 6	4	9	4 15	1 37	7 27	5 0	5 43	5 50	4 22	1 15	5 20	6 44	4 27	3 14	4 21	7 33	3 41	4 23	3 46	8 11	3 35	7 2	
10	8 5	4	10	5 15	2 13	7 25	5 2	6 24	5 53	5 0	2 14	5 18	6 45	4 52	4 23	4 19	7 35	4 7	5 38	3 46	8 12	4 17	8 14	
11	8 5	4	12	6 10	2 54	7 24	5 4	7 0	4 23	6 26	5 55	5 13	6 48	5 15	5 33	4 17	7 36	4 31	6 54	3 45	8 13	5 10	9 21	
12	8 4	4	14	7 1	3 42	7 22	5 6	7 31	5 57	6 0	4 22	5 16	6 50	5 40	6 45	4 15	7 38	5 5	8 11	3 45	8 14	6 12	10 16	
13	8 3	4	15	7 46	4 34	7 20	5 8	7 56	6 34	6 21	5 58	6 27	5 29	5 11	6 50	6 6	8 0	4 14	7 39	5 42	9 25	3 45	8 15	
14	8 2	4	17	8 25	5 32	7 18	5 10	8 22	7 40	6 18	6 0	6 50	6 39	5 9	6 52	6 34	9 15	4 12	7 41	6 28	10 32	3 45	8 16	
15	8 1	4	19	8 58	6 33	7 16	5 12	8 46	8 50	6 16	6 2	7 13	7 49	5 7	6 53	7 10	29	4 11	7 42	7 23	11 32	3 44	8 16	
16	8 0	4	20	9 28	7 37	7 10	5 14	9 8	9 59	6 13	6 4	7 38	9 0	5 5	6 55	7 47	11 38	4 10	7 44	8 28	Morn	3 44	8 16	
17	7 59	4	21	9 53	8 42	7 12	5 16	9 33	11 8	6 11	6 8	8 51	1 4	5 2	6 57	8 35	Morn	4 8	7 45	9 39	0 20	3 44	8 16	
18	7 58	4	23	10 17	9 50	7 11	5 18	10 1	Morn	6 9	6 8	8 34	11 27	5 0	6 59	9 33	0 40	4 6	7 47	10 54	1 2	3 44	8 17	
19	7 57	4	24	10 39	10 59	7 9	5 19	10 31	0 22	6 7	6 10	9 8	Morn	4 58	7 0	10 39	1 34	4 5	7 48	Aft.	1 35	3 44	8 17	
20	7 56	4	26	11 3	3 Morn	7 5	5 21	11 9	1 34	6 5	6 11	9 50	0 37	4 56	7 2	11 9	2 19	4 4	7 49	1 24	2 1	3 44	8 18	
21	7 55	4	28	11 28	0 9	7 5	5 23	11 52	2 45	6 3	6 12	10 41	1 43	4 55	7 6	Aft.	2 57	4 3	7 50	2 38	2 27	3 44	8 19	
22	7 54	4	30	11 59	1 21	7 3	5 25	Aft.	3 51	6 1	6 14	11 41	2 44	4 53	7 6	2 21	3 27	4 2	7 52	3 49	2 49	3 44	8 19	
23	7 53	4	32	Aft.	2 37	7 1	5 27	1 55	4 50	5 59	6 15	Aft.	3 35	4 51	7 8	3 37	3 54	4 0	7 53	5 1	3 14	3 45	8 19	
24	7 52	4	33	1 12	3 50	6 59	5 29	3 7	5 40	5 57	6 17	2 3	4 19	4 49	7 10	4 51	4 21	3 59	7 55	6 10	3 40	3 45	8 19	
25	7 51	4	34	2 4	5 2	6 56	5 30	4 26	6 22	5 54	6 18	3 20	4 54	4 47	7 11	6 3	4 46	3 58	7 56	7 17	4 6	3 46	8 19	
26	7 50	4	36	3 8	6 7	6 54	5 32	5 44	6 56	5 52	6 20	4 37	5 26	4 45	7 13	7 14	5 10	3 57	7 58	8 21	4 38	3 46	8 18	
27	7 49	4	38	4 19	7 4	6 52	5 34	7 2	7 28	5 50	6 22	5 54	5 54	4 43	7 14	8 23	5 36	3 56	7 59	9 18	5 14	3 46	8 18	
28	7 48	4	40	5 38	7 51	6 50	5 36	8 18	7 55	5 48	6 24	7 9	6 19	4 41	7 16	9 29	6 6	3 55	8 0	10 10	5 55	3 46	8 18	
29	7 46	4	42	6 56	8 26					5 45	6 26	8 23	6 43	4 39	7 17	10 31	6 40	3 54	8 1	11 07	6 42	3 47	8 18	
30	7 45	4	44	8 16	9 2					5 43	6 28	9 33	7 11	4 37	7 19	11 25	7 18	3 52	8 2	11 34	7 37	3 47	8 18	
31	7 43	4	46	9 30	9 29					5 41	6 30	10 39	7 38					3 52	8 3	Morn	8 35			



JULY.				AUGUST.				SEPTEMBER.				OCTOBER.				NOVEMBER.				DECEMBER.			
SUN		MOON		SUN		MOON		SUN		MOON		SUN		MOON		SUN		MOON		SUN		MOON	
Rises	Sets.	Rises	Sets.	Rises	Sets.	Rises	Sets.	Rises	Sets.	Rises	Sets.	Rises	Sets.	Rises	Sets.	Rises	Sets.	Rises	Sets.	Rises	Sets.		
1	3 49	8 18	11 49	10 37	4 25	7 46	11 29	5 13	6 46	Morn	3 28	6 1	5 40	0 16	3 53	6 56	4 32	3 11	3 54	7 46	3 53	4 42	
2	3 49	8 17	Morn	11 45	4 26	7 44	Morn	5 15	6 44	0 15	4 26	6 3	5 38	1 32	4 28	6 57	4 31	4 28	4 19	7 48	3 52	5 54	
3	3 50	8 17	0 10	Aft.	4 28	7 42	0 2	3 27	5 18	6 42	1 22	5 57	5 32	4 13	5 21	7 0	4 27	6 59	5 9	7 48	3 52	7 4	
4	3 51	8 16	0 35	2 5	4 30	7 41	0 43	4 37	5 18	6 40	2 37	5 57	5 30	4 13	5 21	7 2	4 25	8 12	5 40	7 49	3 51	8 9	
5	3 52	8 16	1 0	3 20	4 31	7 40	1 36	5 43	5 20	6 37	3 56	6 31	5 30	4 13	5 21	7 2	4 25	8 12	5 40	7 51	3 51	9 5	
6	3 53	8 15	1 30	4 35	4 33	7 38	2 35	6 38	5 21	6 35	5 18	7 1	6 10	5 27	6 49	6 18	7 4	4 24	9 21	7 52	3 51	10 1	
7	3 54	8 15	2 7	5 40	4 35	7 36	3 46	7 23	5 23	6 32	6 40	7 28	6 12	5 25	8 7	6 44	7 6	4 22	10 22	7 53	3 50	10 44	
8	3 55	8 14	2 54	7 0	4 36	7 34	5 6	8 2	5 25	6 29	8 0	7 55	6 14	5 22	9 21	7 12	7 7	4 22	11 19	7 54	3 50	10 44	
9	3 56	8 14	3 50	8 0	4 38	7 32	6 28	8 35	5 26	6 27	9 15	8 19	6 16	5 20	10 30	7 45	7 9	4 20	Aft.	8 37	3 50	11 51	
10	3 57	8 13	5 0	8 52	4 40	7 31	7 49	9 2	5 27	6 25	10 30	8 45	6 17	5 18	11 35	8 22	7 10	4 19	0 47	9 35	3 49	Aft.	
11	3 58	8 13	6 15	9 39	4 41	7 29	9 27	9 28	5 29	6 22	11 41	9 16	6 19	5 15	Aft.	9 5	7 12	4 17	1 20	10 36	3 49	0 39	
12	3 59	8 12	7 35	10 7	4 42	7 27	10 24	9 54	5 31	6 20	Aft.	9 50	6 20	5 13	1 26	9 55	7 14	4 16	1 48	11 39	3 49	1 1	
13	4 0	8 11	8 56	10 36	4 44	7 25	11 38	10 10	5 32	6 18	1 48	10 29	6 22	5 11	2 10	10 51	7 16	4 14	2 13	Morn	8 0	3 49	
14	4 1	8 10	10 13	11 2	4 45	7 23	Aft.	10 46	5 33	6 16	2 43	11 14	6 22	5 8	2 47	11 50	7 18	4 12	2 34	0 45	8 0	3 49	
15	4 2	8 9	11 28	11 26	4 46	7 21	1 55	11 17	5 35	6 14	3 31	Morn	6 25	5 6	3 18	Morn	7 20	4 11	2 57	1 51	8 1	3 49	
16	4 3	8 8	Aft.	11 52	4 47	7 19	2 57	11 53	5 36	6 12	4 12	0 6	6 27	5 4	3 45	0 51	7 21	4 10	3 17	3 0	8 2	3 49	
17	4 4	8 7	1 50	Morn	4 49	7 17	3 55	Morn	5 38	6 10	4 47	1 22	6 30	5 0	4 32	3 3	7 23	4 9	3 40	4 9	8 3	3 49	
18	4 5	8 6	2 58	0 16	4 51	7 15	4 48	0 33	5 40	6 7	5 15	2 2	6 30	5 0	4 32	3 3	7 25	4 8	4 6	5 20	8 4	3 50	
19	4 6	8 5	4 3	0 44	4 52	7 13	5 32	1 20	5 42	6 5	5 41	3 5	6 31	4 58	4 53	4 10	7 27	4 7	4 35	6 35	8 5	3 50	
20	4 7	8 4	5 5	1 15	4 53	7 11	6 12	2 12	5 43	6 2	6 5	4 10	6 32	4 56	5 15	5 19	7 28	4 6	5 11	7 49	8 5	3 51	
21	4 8	8 3	6 0	1 52	4 55	7 9	6 45	3 11	5 45	6 0	6 27	5 16	6 34	4 54	5 40	6 27	7 30	4 4	4 56	9 1	8 6	3 51	
22	4 10	8 2	6 51	2 34	4 57	7 7	7 12	4 12	5 46	5 58	6 48	6 24	6 36	4 52	6 6	7 40	7 31	4 3	6 50	10 10	8 6	3 51	
23	4 11	8 0	7 33	3 25	4 59	7 5	7 37	5 15	5 48	5 56	7 11	7 36	6 38	4 40	6 37	8 53	7 33	4 0	7 54	11 8	6 3	3 51	
24	4 12	7 58	8 10	4 10	5 1	7 3	8 0	6 20	5 49	5 54	7 36	8 42	6 40	4 47	7 15	10 5	7 34	4 2	9 6	11 58	8 7	3 52	
25	4 14	7 56	8 42	5 17	5 2	7 1	8 23	7 26	5 51	5 52	8 4	9 52	6 42	4 45	8 3	11 13	7 36	3 58	10 22	Aft.	8 7	3 52	
26	4 15	7 54	9 9	6 19	5 3	6 59	8 44	8 33	5 53	5 50	8 37	11 4	6 44	4 43	9 0	Aft.	7 37	3 57	11 40	1 8	8 8	3 53	
27	4 17	7 53	9 32	7 24	5 5	6 57	9 6	9 40	5 55	5 47	9 18	Aft.	6 46	4 41	10 5	1 10	7 39	3 56	Morn	1 36	8 8	3 54	
28	4 19	7 51	9 54	8 29	5 7	6 55	9 33	10 50	5 56	5 45	10 8	1 20	6 48	4 39	11 18	1 54	7 40	3 55	0 57	1 59	8 9	3 55	
29	4 21	7 50	10 16	9 34	5 8	6 53	10 2	11 59	5 58	5 43	11 6	2 20	6 50	4 37	Morn	2 32	7 42	3 55	2 13	2 22	8 9	3 56	
30	4 23	7 49	10 39	10 41	5 10	6 51	10 38	Aft.	5 59	5 41	Morn	3 10	6 51	4 36	0 34	3 2	7 44	3 54	3 29	2 47	8 9	3 57	
31	4 24	7 47	11 21	11 49	5 12	6 49	11 22	2 21	5 59	5 41	Morn	3 10	6 53	4 34	1 53	3 28	7 44	3 54	3 29	2 47	8 9	3 58	



## CHANGES OF THE MOON, 1850,

And when she is at her greatest distance (*Apogee*), or at her least distance (*Perigee*), from the Earth in each lunation.

	FIRST QUARTER.		FULL MOON.		SECOND QUARTER.		NEW MOON.		PERIGEE.		APOGEE.	
	D.	H. M.	D.	H. M.	D.	H. M.	D.	H. M.	D.	H.	D.	H.
JANUARY .. {	21st	.. 9 40 a.m.	28th	.. 0 51 a.m.	5th	.. 8 37 a.m.	13th	.. 11 19 a.m.	27th	.. 4 a.m.	12th.	8 a.m.
FEBRUARY .. {	19th	.. 8 12 a.m.	26th	.. noon.	4th	.. 1 18 a.m.	12th	.. 6 29 a.m.	24th.	11 a.m.	8th.	3 p.m.
MARCH .... {	21st	.. 3 58 a.m.	27th	.. 11 26 p.m.	5th	.. 8 5 p.m.	13th	.. 11 17 p.m.	24th.	3 a.m.	8th.	8 a.m.
APRIL ..... {	19th	.. 10 7 a.m.	26th	.. 11 20 a.m.	4th	.. 3 44 p.m.	12th	.. 0 47 p.m.	18th.	noon	5th.	4 a.m.
MAY ..... {	18th	.. 3 52 p.m.	26th	.. 0 8 a.m.	4th	.. 10 46 a.m.	11th	.. 11 9 p.m.	14th.	8 p.m.	2nd.	midnt.
JUNE ..... {	16th	.. 10 23 p.m.	24th	.. 2 10 p.m.	3rd	.. 3 47 a.m.	10th	.. 7 20 a.m.	11th.	7 p.m.	27th.	4 a.m.
JULY ..... {	16th	.. 6 41 a.m.	25th	.. 5 24 a.m.	2nd	.. 5 58 p.m.	9th	.. 2 27 p.m.	10th.	3 a.m.	24th.	10 a.m.
AUGUST .... {	14th	.. 5 46 p.m.	22nd	.. 9 12 p.m.	1st	.. 5 17 a.m.	7th	.. 9 34 p.m.	7th.	1 p.m.	20th.	3 p.m.
SEPTEMBER {	13th	.. 8 21 a.m.	21st	.. 0 40 p.m.	28th	.. 9 53 p.m.	6th	.. 5 28 a.m.	4th.	10 p.m.	17th.	1 a.m.
OCTOBER.... {	13th	.. 2 30 a.m.	21st	.. 3 11 a.m.	—	—	5th	.. 2 56 p.m.	2nd.	11 p.m.	14th.	6 p.m.
NOVEMBER.. {	11th	.. 11 15 p.m.	19th	.. 4 35 p.m.	26th	.. 0 32 p.m.	4th	.. 2 40 a.m.	23rd.	3 p.m.	11th.	2 p.m.
DECEMBER.. {	11th	.. 8 37 p.m.	19th	.. 5 3 a.m.	25th	.. 9 24 p.m.	3rd	.. 5 16 p.m.	21st.	6 a.m.	9th.	11 a.m.

**TIDE TABLE, showing the TIMES of HIGH WATER at LONDON BRIDGE throughout the Year.**

Days.	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.		
	Morn.	After.	Morn.	After.	Morn.	After.	Morn.	After.	Morn.	After.	Morn.	After.	Morn.	After.	Morn.	After.	Morn.	After.	Morn.	After.	Morn.	After.	Morn.	After.	
1	3 45	4 10	5 5	5 25	4 0	4 20	4 50	5 5	4 55	5 10	5 50	6 10	6 5	6 25	7 0	7 25	8 20	9 5	9 30	10 15	11 50	H. M. N. T.	H. M. N. T.	0 20	0 45
2	4 35	5 0	5 45	6 30	5 40	5 0	5 25	5 30	5 35	5 40	6 35	6 55	6 50	7 10	7 55	8 20	9 45	10 25	11 0	11 40	0 20	0 45	1 10	1 10	
3	5 20	5 50	6 30	6 50	5 15	5 35	6 0	6 20	6 10	6 35	7 00	7 50	7 40	8 5	9 0	9 35	11 10	11 45	N. T.	0 10	1 30	1 30	1 30	1 55	
4	6 15	6 35	7 15	7 35	5 55	6 15	6 40	7 5	7 0	7 25	8 25	9 0	8 40	9 15	10 10	10 45	N. T.	0 20	0 40	1 10	1 50	2 10	2 10	2 30	
5	7 0	7 25	8 5	8 35	6 35	6 55	7 30	8 0	7 55	8 30	9 35	10 5	9 40	10 15	11 25	Midn	0 50	1 20	1 25	1 50	2 30	2 50	2 50	3 10	
6	7 55	8 25	9 10	9 50	7 15	7 45	8 45	9 25	9 15	9 55	10 35	11 5	10 50	11 20	N. T.	0 35	1 45	2 5	2 10	2 30	3 10	3 25	3 30	3 45	
7	9 0	9 35	10 25	11 5	8 10	8 50	10 10	10 45	10 30	11 5	11 35	Midn	11 50	N. T.	1 2	1 30	2 30	2 55	2 55	3 15	3 45	4 5	4 5	4 20	
8	10 10	10 44	11 40	N. T.	9 30	10 15	11 25	Midn	11 35	N. T.	N. T.	0 30	0 20	0 50	1 55	2 20	3 15	3 40	3 35	3 50	4 20	4 40	4 40	5 0	
9	11 20	11 50	0 17	0 44	10 55	11 35	N. T.	0 25	0 5	0 25	0 50	1 15	1 15	1 40	2 45	3 10	3 55	4 20	4 10	4 30	4 55	5 15	5 15	5 35	
10	N. T.	0 20	1 6	1 30	N. T.	0 10	0 50	1 10	0 45	1 10	1 40	2 5	2 6	2 30	3 35	3 55	4 40	5 15	5 35	5 45	5 55	5 55	6 15	6 35	
11	0 45	1 10	1 50	2 10	0 38	1 0	1 30	1 45	1 30	1 45	2 25	2 48	3 0	3 25	4 20	4 45	5 15	5 35	5 25	5 45	6 20	6 45	6 40	7 0	
12	1 30	1 50	2 25	2 45	1 20	1 40	2 0	2 20	2 5	2 25	3 10	3 35	3 50	4 10	5	5 25	5 55	6 20	6 5	6 30	7 10	7 45	7 30	8 0	
13	2 10	2 25	3 0	3 15	2 0	2 20	2 40	2 55	2 45	3 5	3 55	4 20	4 35	5 0	5 50	6 10	6 40	7 5	6 50	7 30	8 25	9 5	8 35		
14	2 45	3 0	3 35	3 50	2 35	2 50	3 10	3 30	3 45	4 45	5 10	5 25	5 50	6 30	6 55	7 30	8 0	7 55	8 35	9 40	10 20	9 45	10 15		
15	3 20	3 35	4 5	4 20	3 10	3 25	3 50	4 5	4 10	4 30	5 35	6 15	6 15	6 40	7 20	8 15	8 40	9 20	10 10	10 50	11 25	10 50	11 20		
16	3 50	4 10	4 35	4 55	3 40	3 55	4 25	4 45	4 50	5 15	6 30	7 0	7 5	7 30	8 15	8 50	10 45	10 45	11 15	11 50	N. T.	11 50	N. T.		
17	4 25	4 40	5 10	5 30	4 15	4 30	5 5	5 30	5 45	6 10	7 30	8 5	8 0	8 30	9 30	10 5	11 20	Midn	11 50	N. T.	0 15	0 35	0 10		
18	4 55	5 15	5 50	6 5	4 50	5 5	5 50	6 15	6 40	7 10	8 35	9 15	9 5	9 35	10 40	11 20	N. T.	0 25	0 15	0 35	0 55	1 15	0 55		
19	5 35	5 50	6 30	6 50	5 25	5 45	6 45	7 15	7 45	8 20	9 45	10 15	10 40	11 55	N. T.	0 50	1 10	0 55	1 15	1 30	1 50	1 40	2 5		
20	6 10	6 30	7 15	7 40	6 5	6 30	7 50	8 30	9 5	9 40	10 50	11 20	11 15	11 50	0 25	0 50	1 30	1 45	1 30	1 45	2 30	2 30	2 50		
21	6 55	7 20	8 15	8 55	6 50	7 20	8 15	9 55	10 15	10 50	11 50	N. T.	N. T.	N. T.	0 20	1 15	1 35	2 5	2 20	2 45	3 5	3 15	3 35		
22	7 45	8 15	9 35	10 15	7 55	8 35	10 40	11 20	11 25	11 55	0 15	0 45	0 45	1 10	1 55	2 10	2 35	2 50	2 35	2 55	3 45	3 50	4 15		
23	8 50	9 30	11 0	11 45	9 20	10 5	11 50	N. T.	N. T.	N. T.	0 20	1 5	1 30	1 35	1 55	2 30	2 45	3 5	3 20	3 10	3 30	4 9	4 30		
24	10 45	N. T.	0 20	0 50	10 50	11 35	0 20	0 45	0 45	1 5	1 50	2 10	2 15	2 30	3 5	3 20	3 40	3 55	3 45	4 5	4 50	5 15	5 35		
25	11 25	Midn	0 50	1 20	N. T.	0 10	1 10	1 35	1 30	1 50	2 30	2 50	2 50	3 10	3 35	3 50	4 10	4 25	4 20	4 40	5 40	6 10	6 30		
26	N. T.	0 30	1 45	2 10	0 40	1 6	1 55	2 10	2 30	2 50	3 30	3 5	3 25	3 40	4 5	4 20	4 45	5 5	5 0	5 20	6 40	7 10	7 25		
27	0 59	1 30	2 35	2 55	1 30	1 55	2 35	2 50	2 50	3 5	3 45	4 0	3 55	4 15	4 35	4 55	5 20	6 25	6 45	6 15	7 40	8 20	8 30		
28	1 54	2 20	3 20	3 40	2 15	2 40	3 10	3 30	3 25	3 40	4 15	4 35	4 30	4 45	5 10	5 30	6 0	6 50	5 45	6 15	7 50	9 40	9 10		
29	2 47	3 15			2 55	3 15	3 45	4 0	4 4	4 15	4 50	5 10	5 5	5 20	5 45	6 5	6 55	7 25	7 50	8 35	10 15	10 55	10 50		
30	3 35	4 0			3 35	3 55	4 20	4 40	4 35	4 50	5 30	5 45	5 40	5 55	6 25	6 50	8 0	8 45	9 20	10 5	11 30	11 55	11 55		
31	4 20	4 40			4 13	4 30			5 10	5 30			6 15	6 40	7 15	7 45			10 50	11 20		0	25		

## TIDE TABLE OF THE PRINCIPAL PORTS,

Showing the time of High Water by adding or subtracting the numbers annexed, from those giving the time of High Water at London Bridge.

	h. m.		h. m.		h. m.
Aberdovy .....	Add 5 23	Guernsey Pier ..	Add 4 23	Agnes, St. Lights	Add 2 23
Aberystwith ....	Add 5 23	Hastings .....	Sub. 3 31	Amsterdam ....	Add 0 53
Achill Head .....	Add 3 53	Holyhead .....	Sub. 4 7	Antwerp .....	Add 2 18
Agnes (St.) Scilly		Howth Harbour ..	Sub. 2 59	Archangel .....	Add 3 53
Isles .....	Add 2 23	Kenmare River ..	Add 1 23	Bayonne .....	Add 1 23
Air Point, Isle of		Kinsale Harbour ..	Add 2 23	Bergen .....	Sub. 0 37
Man .....	Sub. 3 0	Kirkcudbright ..	Sub. 2 52	Bermudas (Isle)	Add 4 53
Alderney Pier, E.		Land's End ....	Add 2 23	Blanco (Cape) Af.	Sub. 4 22
Channel .....	Add 4 38	Leith Pier .....	Add 0 15	Boston .....	Sub. 2 42
Arran Isle, Scot.	Sub. 2 52	Limerick .....	Add 4 23	Botany Bay ....	Sub. 5 53
Baltimore .....	Add 1 38	Lizard .....	Add 0 8	Boulogne .....	Sub. 2 41
Banff .....	Sub. 1 26	Londonerry .....	Add 3 55	Bordeaux .....	Add 4 45
Bantry Bay ....	Add 1 39	Lowestoff .....	Sub. 3 37	Bremen .....	Add 3 53
Barnmouth .....	Add 5 48	Lynn Regis .....	Add 4 38	Brest .....	Add 1 39
Barnstaple Bar..	Add 3 23	Margate .....	Sub. 2 2	Cadiz .....	Add 0 23
Beachy, on Shore	Sub. 3 52	Milford Haven ..	Add 3 38	Caen .....	Sub. 5 7
Beachy (Offing)	Sub. 3 7	Montrose .....	Sub. 0 22	Calais .....	Sub. 2 19
Beaumaris .....	Sub. 3 41	Mount's Bay .....	Add 2 33	Calcutta .....	Add 0 58
Belfast .....	Sub. 4 2	Needle's Point ..	Sub. 4 22	Charlotte (Q.) Sd.	Sub. 5 7
Berwick .....	Add 0 11	Newcastle .....	Add 1 53	Cherbourg .....	Add 5 23
Blakeney Harb.	Add 4 43	Newport .....	Add 4 38	Christmas Harb.	Sub. 4 7
Bridgewater ....	Add 4 38	Newhaven .....	Sub. 2 17	Christmas Sound	Add 0 23
Bridport .....	Add 3 53	Nore Light ....	Sub. 0 58	Churchill River..	Add 5 13
Brighton .....	Sub. 3 0	Orfordness .....	Sub. 3 27	Cornwallis (Port)	Add 4 7
Cardigan Bar ..	Add 4 53	Orkney Isles .....	Sub. 3 37	Dieppe .....	Sub. 3 2
Caermarthen ....	Add 4 3	Pembroke .....	Add 3 57	Drake's Island..	Add 3 38
Carlisle .....	Sub. 2 7	Penance .....	Add 2 23	Drontheim .....	Add 0 8
Carnarvon .....	Sub. 4 47	Peterhead .....	Sub. 1 22	Fayal Town ....	Add 0 13
Chester Bar ....	Sub. 3 37	Plymouth .....	Add 3 26	Francisco (St.) ..	Sub. 2 42
Clear Cape .....	Add 1 53	Portland Race ..	Sub. 4 52	Gibraltar .....	Sub. 2 8
Cork Harbour ..	Add 2 23	Portland Road ..	Add 4 8	Good Hope (C.)	Add 0 53
Cornwall Cape ..	Add 2 23	Port Patrick .....	Sub. 3 7	Good Hope (Tn.)	Add 0 23
Cowes, I. of W.	Sub. 3 22	Portsmouth .....	Sub. 2 27	Goree (Isle) ....	Sub. 0 37
Cromartie .....	Sub. 2 22	Ramsgate .....	Sub. 2 47	Granville .....	Add 4 2
Dartmouth .....	Add 3 58	Rye Harbour .....	Sub. 3 27	Gravelines .....	Sub. 2 14
Deal .....	Sub. 2 52	Scarborough .....	Add 2 18	Hague .....	Add 6 8
Dingle Bay .....	Add 1 23	Silly Islands .....	Add 2 25	Halifax .....	Add 5 23
Donaghadee ....	Sub. 4 52	Selsea Harbour ..	Sub. 2 52	Hamburgh .....	Add 3 35
Donegal Bar .....	Add 2 58	Shannon Mouth ..	Add 1 43	Havre de Grace ..	Sub. 4 15
Dover Pier .....	Sub. 2 57	Sheerness .....	Sub. 1 28	Helena (St.) ....	Add 0 8
Downs (Stream)	Add 0 38	Shields .....	Add 0 53	Hogue (Cape la)	Sub. 2 7
Dublin Bar ....	Sub. 2 55	Shoreham .....	Sub. 2 52	Honfleur .....	Sub. 4 37
Dudgeon Lights	Add 5 23	Sligo Bay .....	Add 3 52	John's, St. Amer.	Add 3 53
Dunbar .....	Sub. 0 13	Southampton ..	Sub. 2 27	Lisbon .....	Add 0 8
Duncansby Head	Sub. 5 52	Spithead .....	Sub. 4 37	Madeira .....	Sub. 2 3
Dundalk .....	Sub. 3 7	St. Ives .....	Add 2 23	Malo's (St.) ....	Add 3 53
Dundee .....	Add 0 28	Sunderland .....	Add 0 53	Monterey .....	Add 5 23
Dungarvon .....	Add 2 23	Swansea .....	Add 3 48	Nantes .....	Add 0 53
Dungeness .....	Sub. 3 17	Tees River .....	Add 1 23	New York .....	Sub. 5 7
Eddystone .....	Add 3 8	Torhay .....	Add 3 58	Nieuport .....	Sub. 2 22
Edinburgh .....	Add 2 23	Tralee Bay .....	Add 1 38	Nootka Sound ..	Sub. 1 17
Exmouth Bar ....	Add 4 18	Tynemouth .....	Add 0 43	Ostend .....	Sub. 1 12
Eyemouth .....	Add 0 8	Waterford .....	Add 3 43	Philadelphia ....	Add 0 53
Falmouth .....	Add 3 8	Wexford .....	Add 5 23	Pickersgill's Har.	Sub. 3 10
Flambro' Head..	Add 2 23	Weymouth .....	Add 4 23	P. of Wales's Fort	Add 5 13
Folkestone, W.P.	Sub. 3 37	Whitby .....	Add 1 38	Quebec .....	Add 5 23
Foreland, North	Sub. 2 22	Whitehaven ....	Sub. 2 52	Resolution Bay..	Add 0 23
Foreland, South	Sub. 2 47	Wicklow .....	Sub. 5 7	Rio Janeiro .....	Sub. 0 2
Fowey .....	Add 3 23	Wisbeach .....	Add 5 23	Rochelle .....	Sub. 1 38
Galloway (Mull)	Sub. 2 52	Yarmouth Roads ..	Sub. 5 27	Rochfort .....	Sub. 2 8
Galway Bay ....	Add 2 23	Yarmouth Sands ..	Sub. 3 37	Rotterdam .....	Add 0 53
Gravesend .....	Sub. 0 37	Youghall .....	Add 2 53	Rouen .....	Sub. 0 52
Greenock .....	Sub. 2 22			Senegal .....	Sub. 3 37
Greenwich .....	Sub. 0 20	Abbeville .....	Sub. 3 37	Valery sur Som.	Sub. 4 7

TABLE, by EDWARD J. DENT, Esq., F.R.A.S., Chronometer-maker to her Majesty, exhibiting the DIFFERENCE of TIME arising from DIFFERENCE IN LONGITUDE between the Observatory at Greenwich, and two or more principal Places in each of the English Counties; also North and South Wales, Edinburgh, Dublin, and Paris.

N.B. The letters S and F denote respectively Slow and Fast.  
W and E „ „ West and East.

		m.	s.			m.	s.
BEDS...	{ Bedford .....	1	52	W. S.	MONM.	{ Monmouth.....	10 48
	{ Leighton Buzzard	2	39	—		{ Abergavenny....	12 0
BERKS.	{ Abingdon .....	5	7	—	NORF..	{ Norwich .....	5 12
	{ Windsor.....	2	22	—		{ Fakenham .....	3 24
BUCKS.	{ Buckingham....	3	57	—	NORTH-	{ Northampton ..	3 36
	{ Aylesbury .....	3	21	—	AMPT.	{ Peterborough ..	0 58
CAMBR.	{ Cambridge.....	0	23	E. F.	NORTH-	{ Alnwick .....	6 48
	{ Ely .....	1	4	—	UMB.	{ Newcastle .....	6 24
CHESH.	{ Chester .....	11	32	W. S.	NOTTS.	{ Nottingham ....	4 41
	{ Macclesfield ...	8	30	—		{ Retford .....	3 25
CORNW.	{ Falmouth .....	20	12	—	OXFORD	{ Oxford .....	5 1
	{ Truro .....	20	6	—		{ Chipping Norton	6 12
CUMB.	{ Carlisle .....	11	38	—	RUTLAND	{ Oakham.....	3 20
	{ Penrith .....	10	56	—	SALOP..	{ Shrewsbury ....	10 56
DERBY.	{ Derby .....	5	52	—		{ Oswestry .....	12 8
	{ Chesterfield ...	5	40	—	SOMER-	{ Taunton .....	12 21
DEVON.	{ Exeter .....	14	18	—	SET	{ Bath .....	9 26
	{ Plymouth .....	16	30	—	STAF-	{ Stafford .....	8 40
DORSET	{ Dorchester.....	9	43	—	FORD	{ Lichfield.....	7 18
	{ Bridport.....	11	24	—		{ Tamworth .....	6 49
DURH.	{ Durham .....	6	16	—	SUF-	{ Ipswich .....	4 38
	{ Darlington.....	6	12	—	FOLK	{ Bury St. Edmund's	2 53
	{ Colchester .....	3	32	E. F.	SURREY	{ Guildford .....	2 18
ESSEX.	{ Maldon .....	2	42	—		{ Croydon .....	0 26
	{ Chelmsford ....	1	52	—	SUSSEX	{ Brighton .....	0 32
GLOUC.	{ Gloucester.....	8	58	W. S.		{ Hastings .....	2 20
	{ Cheltenham ....	8	16	—		{ Warwick .....	6 20
HANTS.	{ Southampton ..	5	36	—	WARW.	{ Birmingham....	7 33
	{ Portsmouth ....	4	24	—		{ Coventry .....	6 1
HEREF.	{ Hereford .....	10	52	—	WEST-	{ Kendal .....	11 0
	{ Leominster ....	10	54	—	MORL.	{ Appleby.....	10 0
HERTS.	{ Hertford .....	0	16	—	WILTS	{ Marlborough....	6 53
	{ Tring .....	2	38	—		{ Devizes .....	7 55
HUNTS.	{ Huntingdon ....	0	45	—	WOR-	{ Worcester .....	8 41
	{ Kimbolton.....	1	37	—	CESTER	{ Kidderminster ..	8 58
	{ Greenwich Obser.	0	0	—		{ Beverley .....	1 42
KENT..	{ Dover .....	5	16	E. F.	YORKS.	{ York .....	4 24
	{ Tunbridge Wells	1	1	—		{ Leeds .....	6 4
	{ Lancaster .....	11	10	W. S.	NORTH	{ Holyhead .....	18 36
LANC..	{ Manchester ....	9	0	—	WALES	{ Bangor .....	16 14
	{ Liverpool .....	11	53	—	SOUTH	{ Cardigan .....	18 40
LEICES.	{ Leicester .....	4	33	—	WALES	{ Carmarthen ....	17 16
	{ Melton Mowbray	3	33	—			
LIN-	{ Lincoln .....	2	4	—			
COLN	{ Louth .....	0	0	—	EDINBURGH.....	12 43	—
	{ St. Paul's .....	0	23	—			
MID-	{ 82, Strand.....	0	28	—	DUBLIN.....	25 21	—
DLESEX	{ St. James's Church,						
	{ Piccadilly ....	0	32	—	PARIS.....	9 21	E. F.
	{ Hampton Court .	1	20	—			



## THE BAROMETER.

THE rising of the quicksilver generally presages fair weather, the falling generally indicating rain and snow.

When bad weather *quickly* succeeds the falling of the mercury, it will not be of long continuance, and the reverse when fair weather *soon* follows the rise of the quicksilver.

On the contrary, if in bad weather the mercury rises, and continues advancing for two or three days, a continuance of fair weather may be expected. If, in clear weather, the mercury falls for two or three days before rain, it is probable that it will be succeeded by rain and high winds.

In winter, the rising indicates frost; and in frosty weather, if the mercury falls three or four divisions, a thaw; but if rising in a continued frost, it will be accompanied with snow.

In hot weather, the sudden falling of the mercury portends thunder, while if the earth continues moist, and water stands in hollow places, no trust should be put in the clearest sky.

## LAW TERMS, 1850.

HILARY TERM begins Jan. 11th, and ends Jan. 31st, and contains 21 days.

EASTER TERM begins April 15th, and ends May 8th, and contains 24 days.

TRINITY TERM begins May 22nd, and ends June 12th, and contains 22 days.

MICHAELMAS TERM begins Nov. 2nd, and ends Nov. 25th, and contains 24 days.

## POPULATION OF GREAT BRITAIN.

1841..	{ England and Wales .. .. . 15,901,981									
	{ Scotland .. .. . 2,624,586									
	{ Ireland .. .. . 8,205,382									
	{ Guernsey, Jersey, and Man .. .. . 124,079									
Total ..										26,856,028

Annual Births .. .. 517,739 | Annual Deaths .. .. 349,519

Population of London .. .. 1,915,000

Annual Births .. .. 60,240 | Annual Deaths .. .. 45,147

Weekly Averages of Deaths .. .. 850

Of 100,000 persons born, only 33,060 males, and 32,464 females (total, 65,524) attain the age of 21. Of 100 born, only 40 attain the age of 10, and 4 that of 80. At Northampton, of 1,000 born in the same year, only 254 reached the age of 50, and only 1 that of 94. At the age of 32 the mortality of the whole kingdom is 1 in 95.

## NATIONAL DEBT.

THE following Table exhibits the several variations in this public burden at twenty-six different periods, from the year 1688, when it commenced:—

1689 the Debt was .. ..	£664,263	1784 the Debt was .. ..	£249,851,628
1702 .. ..	16,394,702	1790 .. ..	228,231,228
1710 .. ..	50,000,000	1793 .. ..	239,350,148
1714 .. ..	54,145,363	1800 .. ..	451,699,919
1720 .. ..	54,272,000	1805 .. ..	549,137,068
1727 .. ..	52,092,238	1810 .. ..	631,369,168
1730 .. ..	47,705,100	1815 .. ..	848,284,000
1740 .. ..	44,072,024	1817 .. ..	848,282,477
1750 .. ..	72,178,898	1820 .. ..	848,395,804
1760 .. ..	88,341,268	1825 .. ..	833,391,875
1763 .. ..	138,865,430	1833 .. ..	781,378,549
1770 .. ..	126,963,267	1838 .. ..	762,771,224
1780 .. ..	142,113,264	1841 .. ..	837,521,684



## STAMP DUTIES.

## BILLS.

Not exceeding 2 months aft. date, or 60 days aft. sight.	Longer period.
For £2 .. £5 5s. 1 0 .. 1 6	
Above 5 5s. 20 .. 1 6 .. 2 0	
20 .. 30 .. 2 0 .. 2 6	
30 .. 50 .. 2 6 .. 3 6	
50 .. 100 .. 3 6 .. 4 6	
100 .. 200 .. 4 6 .. 5 0	
200 .. 300 .. 5 0 .. 6 0	
300 .. 500 .. 6 0 .. 8 6	
500 .. 1,000 .. 8 6 .. 12 6	
1,000 .. 2,000 .. 12 6 .. 15 0	
2,000 .. 3,000 .. 15 0 .. 25 0	
3,000 .. .. 25 0 .. 30 0	

Penalty for post-dating Bills of Exchange £100.

## FOREIGN.

When in sets, then for every bill of each set not exceed. £100	s. d.
Above 100 and not above 200 ..	3 0
200 .. .. 500 ..	4 0
500 .. .. 1,000 ..	5 0
1,000 .. .. 2,000 ..	7 6
2,000 .. .. 3,000 ..	10 0
3,000 .. .. ..	15 0

N.B.—Promissory notes for £100 or under are not to be drawn payable to the bearer on demand, except bankers' reissuable notes, which require a different stamp.

## AGREEMENTS.

Of the value of £20 and upwards, containing only 1080 words, 2s. 6d.; more than 1080 words, £1. 15s.; and for every further 1080 words, £1. 5s. Agreements requiring the 2s. 6d. stamp must be stamped within fourteen days from the date; afterwards they can only be stamped upon payment of a penalty of £10.

## CONVEYANCES.

When consideration under £20	10s.
Under Duty	Under Duty
£50 .. £1 0	8,000 .. £75
150 .. 1 10	9,000 .. 85
300 .. 2 0	10,000 .. 95
500 .. 3 0	12,500 .. 110
750 .. 6 0	15,000 .. 130
1,000 .. 9 0	20,000 .. 170
2,000 .. 12 0	30,000 .. 240
3,000 .. 25 0	40,000 .. 350
4,000 .. 35 0	50,000 .. 450
5,000 .. 45 0	60,000 .. 550
6,000 .. 55 0	80,000 .. 650
7,000 .. 65 0	100,000 .. 800

## LETTERS OF ATTORNEY.

Commission or factory, or deed of  
procuration .. .. £1 0  
Progressive duty on words.

## PROBATE OF WILLS, &amp;c.

	With a Will.	Without a Will.
Under £50 ..	—	£0 10
100 ..	£0 10	1 0
200 ..	2 0	3 0
300 ..	5 0	8 0
450 ..	8 0	11 0
600 ..	11 0	15 0
800 ..	15 0	22 0
1,000 ..	22 0	30 0
1,500 ..	30 0	45 0
2,000 ..	40 0	60 0
3,000 ..	50 0	75 0
4,000 ..	60 0	90 0
5,000 ..	80 0	120 0
6,000 ..	100 0	150 0
7,000 ..	120 0	180 0
8,000 ..	140 0	210 0
9,000 ..	160 0	240 0
10,000 ..	180 0	270 0
12,000 ..	200 0	300 0
14,000 ..	220 0	330 0
16,000 ..	250 0	375 0
18,000 ..	280 0	420 0
20,000 ..	310 0	465 0
23,000 ..	350 0	523 0
30,000 ..	400 0	600 0
35,000 ..	450 0	675 0
40,000 ..	525 0	785 0
45,000 ..	600 0	980 0
50,000 ..	675 0	1,010 0
60,000 ..	750 0	1,125 0
70,000 ..	900 0	1,350 0
80,000 ..	1,050 0	1,575 0
90,000 ..	1,200 0	1,800 0
100,000 ..	1,350 0	2,025 0
120,000 ..	1,500 0	2,250 0

The scale continues to increase up to  
£1,000,000.

## LICENSES.

For Marriage in England (special)	£5 0
Ditto (if not special)	0 10
For Bankers ..	30 0
Dealers in Gold ..	4 0

## BONDS, MORTGAGES, &amp;c.

Not exceeding £50 ..	£1 0
Above £50 and not above £100 ..	1 10
100 ..	2 0
200 ..	3 0
300 ..	4 0
500 ..	5 0
1,000 ..	6 0
2,000 ..	7 0
3,000 ..	8 0
4,000 ..	9 0
5,000 ..	10 0
10,000 ..	15 0
15,000 ..	20 0
20,000 ..	25 0

## RECEIPTS.

			s.	d.
For £5 and under	£10	..	..	0 3
10	..	20	..	0 6
20	..	50	..	1 0
50	..	100	..	1 6
100	..	200	..	2 6
200	..	300	..	4 0
300	..	500	..	5 0
500	..	1,000	..	7 6
1,000 or upwards	..	..	..	10 0

## LEASES.

Where rent under	£20	..	..	1 0
If £20 and under	100	..	..	1 10
100	..	200	..	2 0
200	..	400	..	3 0
400	..	600	..	4 0
600	..	800	..	5 0
800	..	1,000	..	6 0
1000 or upwards	..	..	..	10 0

## MARINE INSURANCE.

	s.	d.
If the premium does not exceed the rate of 10s. per centum on the sum insured	..	0 3
Not exceeding 20s. per cent.	..	0 6
Not exceeding 30s. per cent.	..	1 3
Not exceeding 40s. per cent.	..	2 0
Not exceeding 50s. per cent.	..	3 0
If exceeding 50s. per centum	..	4 0
Policy for any certain period of time, for every £100, and also for any fractional part of £100—		
Not exceeding 6 calendar months	..	2 6
Exceeding 6 calendar months	..	4 0

## ASSESSED TAXES.

## WINDOWS.

No. of Win.	Duty Yearly.	No. of Windows.	Duty Yearly.
	£ s. d.		£ s. d.
8	0 16 6	35	11 18 3
9	1 1 0	36	12 6 9
10	1 8 0	37	12 15 3
11	1 16 3	38	13 3 6
12	2 4 9	39	13 12 0
13	2 13 3	40 to 41	14 8 9
14	3 1 9	45 .. 49	15 16 9
15	3 10 0	50 .. 54	17 5 0
16	3 18 6	55 .. 59	18 13 0
17	4 7 0	60 .. 61	19 17 9
18	4 15 3	65 .. 69	20 0 3
19	5 3 9	70 .. 74	22 2 6
20	5 12 3	75 .. 79	23 5 0
21	5 0 6	80 .. 84	24 7 6
22	6 9 0	85 .. 89	25 10 0
23	6 17 6	90 .. 94	26 12 3
24	7 5 9	95 .. 99	27 14 9
25	7 14 3	100 .. 109	29 8 6
26	8 2 9	110 .. 119	31 13 3
27	8 11 0	120 .. 129	33 18 3
28	8 19 6	130 .. 139	35 3 0
29	9 8 0	140 .. 149	38 8 0
30	9 16 3	150 .. 159	40 12 9
31	10 4 9	160 .. 169	42 17 9
32	10 13 3	170 .. 179	45 2 6
33	11 1 6	180 & up-	
34	11 10 0	wards	46 11 3

*Exemptions.*—Charity schools, hospitals, and poor-houses (excepting the apartments for officers and servants); places for divine worship; dairies and cheese-rooms if made of lath or wire, or of glass, if the room not used to sleep in, and "dairy and cheese-room" is painted over the door. Three windows

in the shop or warehouse, if on the basement story. The windows of a room used solely as a manufactory, if not communicating with the dwelling-house, though adjoining thereto. Windows in any farm-house occupied by a tenant at a rack-rent less than £200 per annum; or any farm-house occupied by the owner or tenant of any farm not rack-rent, of which the yearly value shall be under £100 per annum, provided the owner of such farm-house shall not derive any yearly income exceeding £100 from any other source.

## PENALTIES UNDER THE STAMP ACT.

For *Attorneys* and *Solicitors* acting without having been admitted, £100.—For acting without certificate, £50.

For drawing a *Bill* or *Promissory Note* upon unstamped paper, £50.—For post-dating *Bills of Exchange*, £100.

For drawing a *Cheque* more than ten miles from the place where made payable, £100.—For receiving the same in payment, £20.—For Bankers paying the same, £100.

For setting out wrong amount in a *Conveyance*, on the attorney, £500. On the purchaser, £50.

For taking possession of effects of any one deceased, without taking *Probate* or *Administration* within six months, £100.

For giving a *Receipt* upon unstamped paper, if under £100—£10; if above £100—£20.—For refusing to give a receipt upon a stamp, £10.—For giving a receipt upon a stamp too low for the amount thereon specified, £10.—For giving the receipt for less than the sum received, £50.

TABLE showing the RATES of PROPERTY and INCOME TAX.

£	£ s. d.	£	£ s. d.	£	£ s. d.	£	£ s. d.
5	0 2 11	300	8 15 0	1,400	40 16 8	3,600	105 0 0
10	0 5 10	325	9 9 7	1,500	43 15 0	3,700	107 18 4
15	0 8 9	350	10 4 2	1,600	46 13 4	3,800	110 16 8
20	0 11 8	375	10 18 9	1,700	49 11 8	3,900	113 15 0
25	0 14 7	400	11 13 4	1,800	52 10 0	4,000	116 13 4
50	1 9 2	425	12 7 11	1,900	55 8 4	4,100	119 11 8
100	2 18 4	450	13 2 6	2,000	58 6 8	4,200	122 10 0
125	3 12 11	475	13 17 1	2,100	61 5 0	4,300	125 8 4
150	4 7 6	500	14 11 8	2,200	64 3 4	4,400	128 6 8
155	4 10 5	550	16 0 10	2,300	67 1 8	4,500	131 5 0
160	4 13 4	600	17 10 0	2,400	70 0 0	4,600	134 3 4
165	4 16 3	650	18 19 2	2,500	72 18 4	4,700	137 1 8
170	4 19 2	700	20 8 4	2,600	75 16 8	4,800	140 0 0
175	5 2 1	750	21 17 6	2,700	78 15 0	4,900	142 18 4
180	5 5 0	800	23 6 8	2,800	81 13 4	5,000	145 16 8
185	5 7 11	850	24 15 10	2,900	84 11 8	7,500	218 15 0
190	5 10 10	900	26 5 0	3,000	87 10 0	10,000	291 13 4
195	5 13 9	950	27 14 2	3,100	90 8 4	20,000	583 6 8
200	5 16 8	1,000	29 3 4	3,200	93 6 8	30,000	875 0 0
225	6 11 3	1,100	32 1 8	3,300	96 5 0	40,000	1,166 13 4
250	7 5 10	1,200	35 0 4	3,400	99 3 4	50,000	1,458 6 8
275	8 0 5	1,300	37 18 0	3,500	102 1 0		

TABLE of INCOME or WAGES.

Per Yr.	Per Month.	Per Week.	Per Day.	Per Yr.	Per Month.	Per Week.	Per Day.
£ s.	£ s. d.	£ s. d.	£ s. d.	£ s.	£ s. d.	£ s. d.	£ s. d.
1 0	0 1 8	0 0 4½	0 0 0¾	14 0	1 3 4	0 5 4½	0 0 9½
1 10	0 2 6	0 0 7	0 0 1	15 0	1 5 0	0 5 9	0 0 10
2 0	0 3 4	0 0 9½	0 0 1½	16 0	1 6 8	0 6 2	0 0 10½
2 2	0 3 6	0 0 9¾	0 0 1½	17 0	1 8 4	0 6 6½	0 0 11½
2 10	0 4 2	0 0 11½	0 0 1¾	18 0	1 10 0	0 6 11	0 0 11½
3 0	0 5 0	0 0 1½	0 0 2	19 0	1 11 8	0 7 3½	0 1 0½
3 3	0 5 13	0 1 2½	0 0 2	20 0	1 13 4	0 7 8	0 1 1½
3 10	0 5 10	0 1 4½	0 0 2½	30 0	2 10 0	0 11 6	0 1 7½
4 0	0 6 8	0 1 6½	0 0 2½	40 0	3 6 8	0 15 4½	0 2 2½
4 4	0 7 0	0 1 7½	0 0 2¾	50 0	4 3 4	0 19 3	0 2 9
4 10	0 7 6	0 1 8½	0 0 3	60 0	5 0 0	1 3 0½	0 3 3½
5 0	0 8 4	0 1 11	0 0 3½	70 0	5 16 8	1 6 11	0 3 10
5 10	0 9 2	0 2 1½	0 0 3½	80 0	6 13 4	1 10 9	0 4 4½
6 0	0 10 0	0 2 3½	0 0 4	90 0	7 10 0	1 14 7½	0 4 11
6 10	0 10 10	0 2 6	0 0 4½	100 0	8 6 8	1 18 5	0 5 5½
7 0	0 11 8	0 2 8½	0 0 4½	200 0	16 13 4	3 16 11	0 10 11½
7 10	0 12 6	0 2 10½	0 0 5	300 0	25 0 0	5 15 4½	0 16 5½
8 0	0 13 4	0 3 1	0 0 5½	400 0	33 6 8	7 13 10	1 1 11
8 10	0 14 2	0 3 3½	0 0 5½	500 0	41 13 4	9 12 3½	1 7 4½
9 0	0 15 0	0 3 5½	0 0 6	600 0	50 0 0	11 10 9	1 12 10½
10 0	0 16 8	0 3 10	0 0 6½	700 0	58 6 8	13 9 2½	1 18 4½
11 0	0 18 4	0 4 3	0 0 7½	800 0	66 13 4	15 7 6½	2 3 10
12 0	1 0 0	0 4 7½	0 0 8	900 0	75 0 0	17 6 1½	2 9 3½
13 0	1 1 8	0 5 0	0 0 8½	1000 0	83 6 8	19 4 7½	2 14 9½

## INTEREST from £1 to £500, at FIVE PER CENT.

	1 Day.	2 Days.	3 Days.	4 Days.	5 Days.	10 Days.	20 Days.	30 Days.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	£ s. d.	£ s. d.
1	0 0	0 0	0 0	0 0	0 0	0 0 $\frac{1}{4}$	0 0 0 $\frac{1}{2}$	0 0 0 $\frac{3}{4}$
2	0 0	0 0	0 0	0 0 $\frac{1}{4}$	0 0 $\frac{1}{4}$	0 0 $\frac{1}{4}$	0 0 1 $\frac{1}{4}$	0 0 1 $\frac{3}{4}$
3	0 0	0 0	0 0 $\frac{1}{4}$	0 0 $\frac{1}{4}$	0 0 $\frac{1}{4}$	0 0 $\frac{1}{4}$	0 0 1 $\frac{3}{4}$	0 0 2 $\frac{1}{4}$
4	0 0	0 0 $\frac{1}{4}$	0 0 $\frac{1}{4}$	0 0 $\frac{1}{4}$	0 0 $\frac{1}{4}$	0 1 $\frac{1}{4}$	0 0 2 $\frac{1}{4}$	0 0 3 $\frac{1}{4}$
5	0 0	0 0 $\frac{1}{4}$	0 0 $\frac{1}{4}$	0 0 $\frac{1}{4}$	0 0 $\frac{1}{4}$	0 1 $\frac{1}{4}$	0 0 3 $\frac{1}{4}$	0 0 4 $\frac{1}{4}$
6	0 0	0 0 $\frac{1}{4}$	0 0 $\frac{1}{4}$	0 0 $\frac{1}{4}$	0 0 $\frac{1}{4}$	0 1 $\frac{3}{4}$	0 0 3 $\frac{3}{4}$	0 0 5 $\frac{1}{4}$
7	0 0	0 0 $\frac{1}{4}$	0 0 $\frac{1}{4}$	0 0 $\frac{1}{4}$	0 0 $\frac{1}{4}$	0 1	0 0 4 $\frac{1}{4}$	0 0 6 $\frac{1}{4}$
8	0 0 $\frac{1}{4}$	0 0 $\frac{1}{4}$	0 0 $\frac{1}{4}$	0 1	0 1 $\frac{1}{4}$	0 2 $\frac{1}{4}$	0 0 5 $\frac{1}{4}$	0 0 7 $\frac{1}{4}$
9	0 0 $\frac{1}{4}$	0 0 $\frac{1}{4}$	0 0 $\frac{1}{4}$	0 1	0 1 $\frac{1}{4}$	0 2 $\frac{1}{4}$	0 0 5 $\frac{1}{4}$	0 0 8 $\frac{1}{4}$
10	0 0 $\frac{1}{4}$	0 0 $\frac{1}{4}$	0 0 $\frac{1}{4}$	0 1 $\frac{1}{4}$	0 1 $\frac{1}{4}$	0 3 $\frac{1}{4}$	0 0 6 $\frac{1}{4}$	0 0 9 $\frac{1}{4}$
20	0 0 $\frac{1}{2}$	0 1 $\frac{1}{4}$	0 1 $\frac{1}{4}$	0 2 $\frac{1}{4}$	0 3 $\frac{1}{4}$	0 6 $\frac{1}{4}$	0 1 1	0 1 7 $\frac{1}{4}$
30	0 0 $\frac{1}{2}$	0 1 $\frac{1}{4}$	0 2 $\frac{1}{4}$	0 3 $\frac{1}{4}$	0 4 $\frac{1}{4}$	0 9 $\frac{1}{4}$	0 1 7 $\frac{1}{4}$	0 2 5 $\frac{1}{4}$
40	0 1 $\frac{1}{4}$	0 2 $\frac{1}{4}$	0 3 $\frac{1}{4}$	0 5 $\frac{1}{4}$	0 6 $\frac{1}{4}$	1 1	0 2 2 $\frac{1}{4}$	0 3 3 $\frac{1}{4}$
50	0 1 $\frac{1}{4}$	0 3 $\frac{1}{4}$	0 4 $\frac{1}{4}$	0 6 $\frac{1}{4}$	0 8	1 4 $\frac{1}{4}$	0 2 8 $\frac{1}{4}$	0 4 1 $\frac{1}{4}$
60	0 1 $\frac{1}{4}$	0 3 $\frac{1}{4}$	0 5 $\frac{1}{4}$	0 7 $\frac{1}{4}$	0 9 $\frac{1}{4}$	1 7 $\frac{1}{4}$	0 3 3 $\frac{1}{4}$	0 4 11
70	0 2 $\frac{1}{4}$	0 4 $\frac{1}{4}$	0 6 $\frac{1}{4}$	0 9	0 11 $\frac{1}{4}$	1 11	0 3 10	0 5 9
80	0 2 $\frac{1}{4}$	0 5 $\frac{1}{4}$	0 7 $\frac{1}{4}$	0 10 $\frac{1}{4}$	1 1	2 2 $\frac{1}{4}$	0 4 4 $\frac{1}{4}$	0 6 6 $\frac{1}{4}$
90	0 2 $\frac{1}{4}$	0 5 $\frac{1}{4}$	0 8 $\frac{1}{4}$	0 11 $\frac{1}{4}$	1 2 $\frac{1}{4}$	2 5 $\frac{1}{4}$	0 4 11	0 7 4 $\frac{1}{4}$
100	0 3 $\frac{1}{4}$	0 6 $\frac{1}{4}$	0 9 $\frac{1}{4}$	1 1	1 4 $\frac{1}{4}$	2 8 $\frac{1}{4}$	0 5 5 $\frac{1}{4}$	0 8 2 $\frac{1}{4}$
200	0 6 $\frac{1}{4}$	1 1	1 7 $\frac{1}{4}$	2 2 $\frac{1}{4}$	2 8 $\frac{1}{4}$	5 5 $\frac{1}{4}$	0 10 11 $\frac{1}{4}$	0 16 5 $\frac{1}{4}$
300	0 9 $\frac{1}{4}$	1 7 $\frac{1}{4}$	2 5 $\frac{1}{4}$	3 3 $\frac{1}{4}$	4 1 $\frac{1}{4}$	8 2 $\frac{1}{4}$	0 16 5 $\frac{1}{4}$	1 4 7 $\frac{1}{4}$
400	1 1	2 2 $\frac{1}{4}$	3 3 $\frac{1}{4}$	4 4 $\frac{1}{4}$	5 5 $\frac{1}{4}$	10 11 $\frac{1}{4}$	1 1 11	1 12 10 $\frac{1}{4}$
500	1 4 $\frac{1}{4}$	2 8 $\frac{1}{4}$	4 1 $\frac{1}{4}$	5 5 $\frac{1}{4}$	6 10	13 8 $\frac{1}{4}$	1 7 4 $\frac{1}{4}$	2 1 1

## INTEREST from £1 to £500 at FIVE PER CENT.

	1 Mon.	2 Mon.	3 Mon.	4 Mon.	5 Mon.	6 Mon.	9 Mon.	12 Mon.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1	0 0 1	0 0 2	0 0 3	0 0 4	0 0 5	0 0 6	0 0 9	0 1 0
2	0 0 2	0 0 4	0 0 6	0 0 8	0 0 10	0 1 0	0 1 6	0 2 0
3	0 0 3	0 0 6	0 0 9	0 1 0	0 1 3	0 1 6	0 2 3	0 3 0
4	0 0 4	0 0 8	0 1 0	0 1 4	0 1 8	0 2 0	0 3 0	0 4 0
5	0 0 5	0 0 10	0 1 3	0 1 8	0 2 1	0 2 6	0 3 9	0 5 0
6	0 0 6	0 1 0	0 1 6	0 2 0	0 2 6	0 3 0	0 4 6	0 6 0
7	0 0 7	0 1 2	0 1 9	0 2 4	0 2 11	0 3 6	0 5 3	0 7 0
8	0 0 8	0 1 4	0 2 0	0 2 8	0 3 4	0 4 0	0 6 0	0 8 0
9	0 0 9	0 1 6	0 2 3	0 3 0	0 3 9	0 4 6	0 6 9	0 9 0
10	0 0 10	0 1 8	0 2 6	0 3 4	0 4 2	0 5 0	0 7 6	0 10 0
20	0 1 8	0 3 4	0 5 0	0 6 8	0 8 4	0 10 0	0 15 0	1 0 0
30	0 2 6	0 5 0	0 7 6	0 10 0	0 12 6	0 15 0	1 2 6	1 10 0
40	0 3 4	0 6 8	0 10 0	0 13 4	0 16 8	1 0 0	1 10 0	2 0 0
50	0 4 2	0 8 4	0 12 6	0 16 8	1 0 10	1 5 0	1 17 6	2 10 0
60	0 5 0	0 10 0	0 15 0	1 0 0	1 5 0	1 10 0	2 5 0	3 0 0
70	0 5 10	0 11 8	0 17 6	1 3 4	1 9 2	1 15 0	2 12 6	3 10 0
80	0 6 8	0 13 4	1 0 0	1 6 8	1 13 4	2 0 0	3 0 0	4 0 0
90	0 7 6	0 15 0	1 2 6	1 10 0	1 17 6	2 5 0	3 7 6	4 10 0
100	0 8 4	0 16 8	1 5 0	1 13 4	2 1 8	2 10 0	3 15 0	5 0 0
200	0 16 0	1 13 4	2 10 0	3 6 8	4 3 4	5 0 0	7 10 0	10 0 0
300	1 5 0	2 10 0	3 15 0	5 0 0	6 5 0	7 10 0	11 5 0	15 0 0
400	1 13 4	3 6 8	5 0 0	6 13 4	8 6 8	10 0 0	15 0 0	20 0 0
500	2 1 8	4 3 4	6 5 0	8 6 8	10 8 4	12 10 0	18 15 0	25 0 0



## CURRENT COINS.

## GREAT BRITAIN.

*Gold.*

		dwt.grs.	£ s. d.
Double sovereign	..	10 6½	2 0 0
Sovereign	..	5 3½	1 0 0
Half-sovereign	..	2 13½	0 10 0

*Silver.*

		dwt.	grs.	£ s. d.
Crown	..	18	4½	0 5 0
Half-crown	..	9	2	0 2 6
Shilling	..	3	15½	0 1 0
Sixpence	..	1	19½	0 0 6
Fourpence	..	1	5	0 0 4

*Note.*—The standard for gold coin in Great Britain is a mixture of eleven parts fine gold and one of alloy, 1 lb. troy of which is coined into 46 sovereigns and  $\frac{89}{120}$  of another.

The standard for silver coin is a mixture of thirty-seven parts of fine silver and three of alloy, 1 lb. troy of which is coined into 66 shillings.

## FRANCE.

*Gold.*

		dwt.grs.	£ s. d.
40 Franc piece	..	8 7	1 11 8½
20 do.	..	4 3½	0 15 10½

*Silver.*

		dwt.	grs.	£ s. d.
5 Franc piece	..	16	1	0 4 0
2 do.	..	6	11	0 1 7
1 do.	..	3	5½	0 0 9½
½ or 50 centimes	..	1	15	0 0 4½
¼ or 25 do.	..	0	18½	0 0 2½

## HAMBURG.

*Gold.*

Ducat of 6½ marks	..	2 5½	0 9 4
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*Silver.*

Rix-doll. or 3 marks	..	18 18	0 4 7
Mark, or 16 shillings	..	5 20	0 1 2½

## HOLLAND.

*Gold.*

20 Florin piece	..	9 7½	1 14 2½
Ryder	..	6 10½	1 5 1½
10 Florin piece	..	4 15	0 17 1
10 Williams, 1818	..	7 7½	0 16 5½

*Silver.*

Ducaton	..	20 22	0 5 5
Ducat or rix-dollar	..	18 6	0 4 4
Florin	..	6 22	0 1 8½
Escalin	..	3 4	0 0 6

## SPAIN.

*Gold.*

Doubloon of 8 crowns	..	17 9	3 4 8
Ditto 4 do.	..	8 16½	1 12 4
Ditto 2 do.	..	4 8½	0 16 2
Half pistole, or crown	..	2 4	0 8 1

*Silver.*

		dwt.grs.	£ s. d.
Piastre	..	17 8	0 4 3½
Peseta	..	3 18	0 0 10½
Half do.	..	1 21	0 0 5½
Reallillo	..	0 22½	0 0 2½

## PORTUGAL.

*Gold.*

Moidore of 4,800 reis	..	6 22	1 6 11½
Half do	..	3 11	0 13 5½
Quarter do.	..	1 17½	0 6 8½
Moiadobra	..	9 5	1 15 11
Half do.	..	4 14	0 17 10½
16 Testons	..	2 7	0 8 11
12 do.	..	1 17½	0 6 4½
8 do.	..	1 3½	0 4 5½
Cruzada	..	0 16½	0 2 7½

*Silver.*

New cruzada of 480 reis	..	9 1	0 4 11
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## RUSSIA.

*Gold.*

Ducat of 1763	..	2 5½	0 9 2½
Imperial of 10 rubles	..	7 17½	1 12 9
Half do.	..	3 20½	0 16 4½

*Silver.*

Ruble of 100 copecks	..	15 10	0 3 2
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## PRUSSIA.

*Gold.*

Frederic d'or	..	4 7	0 16 6
Half do.	..	2 3½	0 8 3
Ducat	..	2 5½	0 9 4

*Silver.*

Rix-dollar	..	14 6½	0 2 11½
5 Groschen	..	2 9	0 0 5½
Groscher	..		0 0 1½

## SWEDEN.

*Gold.*

Ducat	..	2 5	0 9 3½
Half do.	..	1 2½	0 4 7½
Quarter do.	..	0 13½	0 2 3½

*Silver.*

Rix-dollar	..	18 17	0 4 6
Two-thirds do.	..	12 11	0 3 0
One-third do.	..	6 5	0 1 6

## AMERICA (UNITED STATES).

*Gold.*

Eagle of 10 dollars	..	11 6	2 3 10
Half eagle of 5 do.	..	5 15	1 1 11
Quar. eagle of 2½ do.	..	2 19½	0 10 11½

*Silver.*

Dollar or 100 cents	..	17 5	0 4 3
Half-dollar, or 50 do.	..	8 14	0 2 1
Quar. dollar, or 25 do.	..	4 7	0 1 0

## WEIGHTS and MEASURES.

By a law passed in the 51st year of the reign of Henry III., A.D. 1266, it was enacted, "that an English penny, called a sterling, round and without clipping, shall weigh 32 wheat corns in the midst of the ear, and that twelve pence do make one ounce, and that twelve ounces do make one pound."

Some authors consider that the *Avoirdupois* weight was brought into the country at the earliest period of the Romans, and was then called the *AUNCCEL WEIGHT* from its being used with the steel-yard (*Statera Romana*), or with the *AUNCCEL (unsula)* or Danish steel-yard, having a fixed weight and moveable fulcrum. Others consider that the *Lombards* introduced the Troy and Avoirdupois weights, and that these were first sanctioned by law in 1496. All *butchers* were ordered to provide *beams, and scales*, and weights, which weights were called *haberdupois*, in the 24th year of Henry VIII. The hundred-weight, or rather the long hundred of 112 lbs., was first introduced as an allowance over and above the 100 lbs. in paying *custom dues*; that is, for every 112 lbs. weight of goods *dues* were only demanded for 100 lbs. The long hundred at first was allowed to be reckoned at 120 lbs.; it was subsequently lowered to 112½ lbs., and finally the *half-pound* was omitted, and the hundred-weight then, as now, was reckoned at 112 lbs. to the hundred.

The IMPERIAL WEIGHTS of Avoirdupois, Troy, and Apothecaries' came into use, under authority of a law passed in 1824 (5 Geo. IV., cap. 74), on the first day of May, 1825; and, by an Act passed in 1835 (5 & 6 Wm. IV., cap. 63), the use of all other weights is rendered illegal.

## TROY WEIGHT.

## APOTHECARIES' WEIGHT.

Grains.	Pennywts.	Oz.	lbs.	Grns.	Scrup.	Dr.	Oz.	lbs.
1	0·0416	0·002083	0·00017361	1	0·05	0·016	0·002083	0·00017051
24	1	0·05	0·00416	20	1	0·33	0·0416	0·003472
480	20	1	0·083	60	3	1	0·125	0·010416
5760	240	12	1	480	24	8	1	0·083
				5760	288	96	12	1

## AVOIRDUPOIS WEIGHT.

Grains.	Dr.	Oz.	lbs.	Qrs.	Cwt.	Tons.
27·34375	1	0·0625	0·00390625	0·0001395089	0·0000348772	0·00000174386
437·5	16	1	0·0625	0·002231428	0·000557857	0·0000278928
7000	256	16	1	0·35714285	0·0892857842	0·0044642857
196000	7168	448	28	1	0·25	0·0125
784000	28672	1792	112	4	1	0·05
15680000	473440	35840	2240	80	20	1

## TABLE OF EQUIVALENTS.

The following Tables will at once show the Equivalents of Troy weight in Avoirdupois weight, and, *vice versâ*, the equivalents of Avoirdupois weight in Troy weight, so that, with the large Avoirdupois weights generally kept on all works, the table will set forth what weights are correspondent or accord with the Troy weights, thus:—

1 cwt. Avoirdupois will weigh in Troy weight 136 lb. 1 oz. 2 dr. 40 gr., or 784,000 gr. Troy.

1 lb. Troy will weigh in Avoirdupois 13 oz. 7½ grs.

1 lb. Avoirdupois will weigh in Troy 1 lb. 2 oz. 4 drs. 40 grs.

The Troy lb. is 5,760 grs. The Avoirdupois is 7,000 grs.

½ cwt. of Avoirdupois (or 56 lbs.) is equivalent to 68 lbs. 0 oz. 5 drs. 20 grs. Troy.

56 lbs. Troy are equivalent to 46 lbs. 1 oz. 12½ grs. Avoirdupois.

1 ton Avoirdupois is equivalent to 2,722 lbs. 2 oz. 5 drs. 20 grs. Troy; and

2,240 lbs. Troy are equivalent to 1,843 lbs. 3 oz. 87½ grs. Avoirdupois.

TROY.		AVOIRDUP.		TROY.		AVOIRDUP.		TROY.		AVOIRDUPOIS.		TROY.		AVOIRDUPOIS.		TROY.					
Grain .. Scripule Dwt. .. Drachm Oz. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	Grains. 1 20 60 240 480 960 1,440 1,920 2,400 2,880 3,360 3,840 4,320 4,800 5,280 5,760 11,520 17,280 23,040 28,800 34,560 40,320 46,080 51,840 57,600 63,360 69,120 74,880 80,640 86,400 92,160	lb. oz. grs.		Grains.		Lb. 17		Grains.		Drachm Oz.		lb. oz. drs. grs.		Lb. 15		Grains.		lb. oz. dr. gr.			
		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		0	1	42½	0	1	42½	0	1	42½	0	1	42½	0	0	7	17½	0	1	40	0
		0	2	85	0	2	85	0	2	85	0	2	85	0	1	6	35	0	2	40	0
		0	3	127½	0	3	127½	0	3	127½	0	3	127½	0	2	5	52½	0	3	5	20
		0	4	170	0	4	170	0	4	170	0	4	170	0	3	5	10	0	4	20	0
		0	5	212½	0	5	212½	0	5	212½	0	5	212½	0	4	4	27½	0	5	3	20
		0	6	255	0	6	255	0	6	255	0	6	255	0	5	3	45	0	6	4	40
		0	7	297½	0	7	297½	0	7	297½	0	7	297½	0	6	3	2½	0	7	2	20
		0	8	340	0	8	340	0	8	340	0	8	340	0	7	2	20	0	8	1	20
		0	9	382½	0	9	382½	0	9	382½	0	9	382½	0	8	1	37½	0	9	6	0
		0	10	425	0	10	425	0	10	425	0	10	425	0	9	0	55	0	10	6	0
		0	11	467½	0	11	467½	0	11	467½	0	11	467½	0	10	0	12½	0	11	7	20
		0	12	510	0	12	510	0	12	510	0	12	510	0	10	7	30	0	12	8	0
		0	13	552½	0	13	552½	0	13	552½	0	13	552½	0	11	6	47½	0	13	9	0
		0	14	595	0	14	595	0	14	595	0	14	595	0	11	6	5	0	14	10	0
		0	15	637½	0	15	637½	0	15	637½	0	15	637½	0	12	5	22½	0	15	11	0
		0	16	680	0	16	680	0	16	680	0	16	680	0	12	4	40	0	16	12	0
		0	17	722½	0	17	722½	0	17	722½	0	17	722½	0	13	3	7	0	17	13	0
		0	18	765	0	18	765	0	18	765	0	18	765	0	14	2	5	120	18	14	0
		0	19	807½	0	19	807½	0	19	807½	0	19	807½	0	14	1	20	0	19	15	0
		0	20	850	0	20	850	0	20	850	0	20	850	0	15	0	55	0	20	16	0
		0	21	892½	0	21	892½	0	21	892½	0	21	892½	0	15	0	55	0	21	17	0
		0	22	935	0	22	935	0	22	935	0	22	935	0	16	0	60	0	22	18	0
		0	23	977½	0	23	977½	0	23	977½	0	23	977½	0	16	0	60	0	23	19	0
		0	24	1,020	0	24	1,020	0	24	1,020	0	24	1,020	0	17	0	65	0	24	20	0
		0	25	1,062½	0	25	1,062½	0	25	1,062½	0	25	1,062½	0	17	0	65	0	25	21	0
		0	26	1,105	0	26	1,105	0	26	1,105	0	26	1,105	0	18	0	70	0	26	22	0
		0	27	1,147½	0	27	1,147½	0	27	1,147½	0	27	1,147½	0	18	0	70	0	27	23	0
		0	28	1,190	0	28	1,190	0	28	1,190	0	28	1,190	0	19	0	75	0	28	24	0
		0	29	1,232½	0	29	1,232½	0	29	1,232½	0	29	1,232½	0	19	0	75	0	29	25	0
		0	30	1,275	0	30	1,275	0	30	1,275	0	30	1,275	0	20	0	80	0	30	26	0
		0	31	1,317½	0	31	1,317½	0	31	1,317½	0	31	1,317½	0	20	0	80	0	31	27	0
		0	32	1,360	0	32	1,360	0	32	1,360	0	32	1,360	0	21	0	85	0	32	28	0
		0	33	1,402½	0	33	1,402½	0	33	1,402½	0	33	1,402½	0	21	0	85	0	33	29	0
		0	34	1,445	0	34	1,445	0	34	1,445	0	34	1,445	0	22	0	90	0	34	30	0
		0	35	1,487½	0	35	1,487½	0	35	1,487½	0	35	1,487½	0	22	0	90	0	35	31	0
		0	36	1,530	0	36	1,530	0	36	1,530	0	36	1,530	0	23	0	95	0	36	32	0
		0	37	1,572½	0	37	1,572½	0	37	1,572½	0	37	1,572½	0	23	0	95	0	37	33	0
		0	38	1,615	0	38	1,615	0	38	1,615	0	38	1,615	0	24	0	100	0	38	34	0
		0	39	1,657½	0	39	1,657½	0	39	1,657½	0	39	1,657½	0	24	0	100	0	39	35	0
		0	40	1,700	0	40	1,700	0	40	1,700	0	40	1,700	0	25	0	105	0	40	36	0
		0	41	1,742½	0	41	1,742½	0	41	1,742½	0	41	1,742½	0	25	0	105	0	41	37	0
		0	42	1,785	0	42	1,785	0	42	1,785	0	42	1,785	0	26	0	110	0	42	38	0
		0	43	1,827½	0	43	1,827½	0	43	1,827½	0	43	1,827½	0	26	0	110	0	43	39	0
		0	44	1,870	0	44	1,870	0	44	1,870	0	44	1,870	0	27	0	115	0	44	40	0
		0	45	1,912½	0	45	1,912½	0	45	1,912½	0	45	1,912½	0	27	0	115	0	45	41	0
		0	46	1,955	0	46	1,955	0	46	1,955	0	46	1,955	0	28	0	120	0	46	42	0
		0	47	1,997½	0	47	1,997½	0	47	1,997½	0	47	1,997½	0	28	0	120	0	47	43	0
		0	48	2,040	0	48	2,040	0	48	2,040	0	48	2,040	0	29	0	125	0	48	44	0
		0	49	2,082½	0	49	2,082½	0	49	2,082½	0	49	2,082½	0	29	0	125	0	49	45	0
		0	50	2,125	0	50	2,125	0	50	2,125	0	50	2,125	0	30	0	130	0	50	46	0
		0	51	2,167½	0	51	2,167½	0	51	2,167½	0	51	2,167½	0	30	0	130	0	51	47	0
		0	52	2,210	0	52	2,210	0	52	2,210	0	52	2,210	0	31	0	135	0	52	48	0
		0	53	2,252½	0	53	2,252½	0	53	2,252½	0	53	2,252½	0	31	0	135	0	53	49	0
		0	54	2,295	0	54	2,295	0	54	2,295	0	54	2,295	0	32	0	140	0	54	50	0
		0	55	2,337½	0	55	2,337½	0	55	2,337½	0	55	2,337½	0	32	0	140	0	55	51	0
		0	56	2,380	0	56	2,380	0	56	2,380	0	56	2,380	0	33	0	145	0	56	52	0
		0	57	2,422½	0	57	2,422½	0	57	2,422½	0	57	2,422½	0	33	0	145	0	57	53	0
		0	58	2,465	0	58	2,465	0	58	2,465	0	58	2,465	0	34	0	150	0	58	54	0
		0	59	2,507½	0	59	2,507½	0	59	2,507½	0	59	2,507½	0	34	0	150	0	59	55	0
		0	60	2,550	0	60	2,550	0	60	2,550	0	60	2,550	0	35	0	155	0	60	56	0
		0	61	2,592½	0	61	2,592½	0	61	2,592½	0	61	2,592½	0	35	0	155	0	61	57	0
		0	62	2,635	0	62	2,635	0	62	2,635	0	62	2,635	0	36	0	160	0	62	58	0
		0	63	2,677½	0	63	2,677½	0	63	2,677½	0	63	2,677½	0	36	0	160	0	63	59	0
		0	64	2,720	0	64	2,720	0	64	2,720	0	64	2,720	0	37	0	165	0	64	60	0
		0	65	2,762½	0	65	2,762½	0	65	2,762½	0	65	2,762½	0	37	0	165	0	65	61	0
		0	66	2,805	0	66	2,805	0	66	2,805	0	66	2,805								

## The GOLD and SILVERSMITHS' DIVISIONS of the TROY WEIGHT.

### OF THE POUND CARRACT.

1 Carract grain is $2\frac{1}{2}$ dwts., or 1 drachm, or	60 troy grains.
1 Carract is 4 carract grains, or $\frac{1}{2}$ oz.,	or 240 "
24 Carracts are 12 oz., or 1 lb. troy,	or 5,760 " "

### OF THE OUNCE CARRACT.

1 Carract grain is 5 grains,	or 5 troy grains.
1 Carract is 4 carract grains,	or 20 "
24 Carracts are 1 oz. troy,	or 480 "

### THE SMALLER DIVISIONS.

24 Blanks make	1 Periot.
20 Periot	" 1 Droit.
24 Droits	" 1 Mite.
20 Mites	" 1 Grain, or 1 troy grain.
24 Grains	" 1 Dwt., or 24 "
20 Dwt.	" 1 Ounce, or 480 "
12 Ounces	" 1 Pound, or 5,760 "

## MEASURES OF LENGTH.

Inches.	Feet.	Yards.	Poles or Perches.	Furlongs.	Miles.
1	0'083	0'027	0'0505	0'00012626	0'00001578282
12	1	0'333	0'6060	0'001515	0'000189393
36	3	1	0'1818	0'004545	0'000568181
192	16'5	5'5	1	0'025	0'003125
7920	660	220	40	1	0'125
63360	5280	1760	320	8	1

## MEASURES OF SUPERFICIES.

Sq. Inch.	Square Feet.	Sq. Yards.	Square Poles.	Roods.	Acres.
1	0'00694	0'0007715	0'0000255076	0'0000006377	0'0000001594
144	1	0'11	0'0036730945	0'0000918274	0'0000229568
1296	9	1	0'0330578512	0'0008264463	0'0002066116
39204	272'25	30'25	1	0'025	0'00625
1568160	10890	1210	40	1	0'25
6272640	43560	4840	160	4	1

## MEASURES OF CAPACITY.

Cubic inches.	Gill.	Pints.	Quarts.	Gallons.	Pecks.	Bushels.	Quarters.
8'6648076103	1	0'25	0'125	0'03125	0'015625	0'00390625	0'00048828125
34'6592304412	4	1	0'5	0'125	0'0625	0'015625	0'001953125
69'3184609825	8	2	1	0'25	0'125	0'03125	0'00390625
277'2738435700	32	8	4	1	0'5	0'125	0'015625
554'5476871400	64	16	8	2	1	0'25	0'03125
2218'1907485601	256	64	32	8	4	1	0'125
17751'2598848179	2048	512	256	64	32	8	1



## LAND MEASURE.

7'92 inches ..	1 link.
100 links, or 22 yards ..	1 chain.
80 chains ..	1 mile.
69'121 miles ..	1 geo. degree.

## SURFACE MEASURE.

62'7264 square inches ..	1 square link.
10,000 square links ..	1 sq. chain.
10 square chains ..	1 acre.
640 acres ..	1 square mile.

## NAUTICAL MEASURE.

1 nautical mile ..	6082'66 feet.
3 miles ..	1 league.
20 leagues ..	1 degree.
360 degrees ..	the earth's circumference.

## SQUARE MEASURE.

144 square inches ..	1 square foot.
9 square feet ..	1 sq. yard.
30½ square yards..	1 square pole.
40 square poles ..	1 rood.
4 roods, or 4840 sq. yds.	1 acre.

## CUBIC MEASURE.

1728 cubic inches ..	1 cubic foot.
27 cubic feet ..	1 cubic yard.
<i>Note.</i> —A cubic foot is equal to 2200 cylindrical inches, or 3300 spherical inches, or 6600 conical inches.	

## LIQUID MEASURE.

8'665 cubic inches ..	1 gill.
4 gills ..	1 pint.
2 pints ..	1 quart.
4 quarts, or 277'274 cub. in.	1 gallon.

## DRY MEASURE.

2 gallons ..	1 peck.
4 pecks, or 2218'192 cub. in.	1 bushel.
8 bushels ..	1 quarter.
5 quarters ..	1 load.

## MISCELLANEOUS.

A cubic inch of distilled water at 62° F.

weighs, in vacuo, 252'72 grs. ; a cubic foot will therefore weigh 62'3862 lbs. avoirdupois. In air, a cubic inch weighs 252'458 grs., and a cubic foot 62'3206 lbs. An ounce of water=1'73298 cubic inches.

Imperial gallon=277'296 cubic inches, or 10 lbs.

Standard avoirdupois pound=7,000 grs. troy.

„ troy pound=5,860 grains troy.

„ gallon=10 lbs. avoirdupois = 277'276 cubic inches.

„ quart=2'5 lbs. avoirdupois.

„ pint=1'25 lbs. avoirdupois = 20 oz. distilled water.

„ peck=2 gallons.

„ bushel=8 galls.=80 lbs. avoirdupois of water.

„ 3 bushels=1 sack.

„ 12 sacks=1 chaldron.

„ perch=16½ feet square.

„ rood=1210 square yards.

„ acre=4840 square yards=160 square perches.

Load of unhewn timber .. 40 cubic ft.

Load of squared timber .. 50 —

Load of inch boards .. 600 sq. ft.

Load of two-inch planks .. 300 —

Hundred of deals .. 120 in numb.

Hundred of nails .. 120 —

Thousand of nails .. 1200 —

Load of bricks .. 500 —

Load of lime .. 32 bushels.

Load of sand .. 36 —

Sack of potatoes or coals .. 224 lbs.

Bushel of salt or flour .. 56 —

Bushel of wheat .. 60 —

Bushel of barley .. 50 —

Bushel of oats .. 40 —

A Spanish and Polish mile is about 3½ English. A Swedish, Danish, and Hungarian mile is from 5 to 6 English miles. A Russian mile, or verst, is about ½ of an English mile, and the French toise is about 6 feet.

## WEIGHTS and MEASURES.

## FRENCH.

## DECIMAL WEIGHTS and their EQUIVALENTS in ENGLISH.

	Equivalents in Grains.	TROY.				AVOIRDUPOIS.		
		lbs.	oz.	drs.	grs.	lbs.	oz.	Troy grains.
1 Myrio-gramme..	154340·234	26	9	4	20	22	0	340
1 Kilo-gramme ..	15434·023	2	8	1	14	2	3	121·5
1 Hecto-gramme..	1543·402	—	3	1	43	—	3	30·9
1 Deca-gramme ..	154·340	—	—	2	34	—	—	154·3
1 Gramme.....	15·434	—	—	—	15·434	—	—	15·434
1 Deci-gramme ..	1·543	—	—	—	1·543	—	—	1·543
1 Centi-gramme ..	0·154	—	—	—	0·154	—	—	0·154
1 Mille-gramme ..	0·015	—	—	—	0·015	—	—	0·015

*Compared with English Imperial Measures.*

The metre, or unit of length=3·2809 imperial feet.

The are, or unit of square measure=14 square yards.

The stère, or unit of solid measure=35·31716 cubic feet.

The litre, or unit of measure for liquids, =61·028 cubic inches, or about ·453 of an imperial gallon.

The gramme, or unit of weight=15·438 troy grains, or ·002205 of a pound avoirdupois.

The kilogramme=2·205 pounds avoirdupois.

## LONG MEASURE.

1 millimetre ..	..	·039371 imp. in.
10 millimetres ..	..	1 centimetre.
10 centimetres ..	..	1 decimetre.
10 decimetres ..	..	1 metre.
10 metres ..	..	1 decametre.
10 decametres ..	..	1 hectometre.
10 hectometres ..	..	1 kilometre.
10 kilometres ..	..	1 myriametre,
or 6 miles, 1 furlong, 28 poles, 2½ yards.		

## SURFACE MEASURE.

1 milliare ..	..	1196 sq. yds.
10 milliares ..	..	1 centiare.
10 centiares ..	..	1 deciare.
10 deciares ..	..	1 are.
10 ares ..	..	1 decare.
10 decares ..	..	1 hectare,
or 2·473614 imperial acres.		

[The are is a square decametre.

## SOLID MEASURE.

1 millistère ..	..	·035317 cubic ft.
10 millistères ..	..	1 centistère.

10 centistères ..	..	1 decistère.
10 decistères ..	..	1 stère.
10 stères ..	..	1 decastère.
10 decastères ..	..	1 hectostère.
10 hectostères ..	..	1 kilostère.
10 kilostères ..	..	1 myriastère.

The stère is a cubic metre.

## MEASURES or CAPACITY.

1 millilitre ..	..	·061028 cub. in.
10 millilitres ..	..	1 centilitre.
10 centilitres ..	..	1 decilitre.
10 decilitres ..	..	1 litre.
10 litres ..	..	1 decalitre.
10 decalitres ..	..	1 hectolitre.
10 hectolitres ..	..	1 kilolitre.
10 kilolitres ..	..	1 myrialitre.

The litre is a cubic decimetre.

## MEASURES of WEIGHT.

1 milligramme ..	..	·015438 troy gr.
10 milligrammes ..	..	1 centigramme.
10 centigrammes ..	..	1 decigramme.
10 decigrammes ..	..	1 gramme.
10 grammes ..	..	1 decagramme.
10 decagrammes ..	..	1 hectogramme.
10 hectogrammes ..	..	1 kilogramme.
10 kilogrammes ..	..	1 myriagramme.

A gramme is the weight of a cubic centimetre of distilled water in vacuo at its maximum density, or at 39° Fahrenheit.

## SYSTEME USUEL.

The toise usuelle=2 metres, or 6 feet 6½ inches.

The pied=13½ inches.

The aune=12 decimetres, or 47½ inches.

The litron=1½ imperial pint, nearly.

The boisseau=1½ imperial peck.

The livre=7717 troy grains.

## MEXICAN WEIGHTS.

12 Grancs	1 Tomin								
36 ———	3 ———	1 Adarma							
72 ———	6 ———	2 ———	1 Drachma						
576 ———	48 ———	16 ———	8 ———	1 Onza					
4,608 ———	384 ———	128 ———	64 ———	8 ———	1 Marco				
9,216 ———	768 ———	256 ———	128 ———	16 ———	2 ———	1 Libra.			

## WEIGHTS used in MINING DISTRICTS.

25 lbs. Spanish	1 Arroba				
100 ———	4 ———	1 Quintal			
300 ———	12 ———	3 ———	1 Carga		

## MAIZE or DRY MEASURE.

2 Quarterones	1 Quartillo				
4 ———	2 ———	1 Almud.			
12 ———	6 ———	3 ———	1 Quartilla		
24 ———	12 ———	6 ———	2 ———	1 Media	
48 ———	24 ———	12 ———	4 ———	2 ———	1 Anega
96 ———	48 ———	24 ———	8 ———	4 ———	2 ——— 1 Carga

## COMPARATIVE WEIGHTS.

1 ounce Troy	contains	480 Grains English.
1 „ Avoirdupois	„	437½ „
1 „ Spanish	„	444 „
100 grains Mexican	equal to	77½ Grains Troy.

The Mexican league is 5,000 varas, equal to 13,760 feet English, or 2½ English miles.

## ASSAY EQUIVALENTS.

Ounces per Quintal.	Marcas per Carga.	Marcas per Bolanos Monton, 15 Quintals.	Marcas per Zacatecas Mont, 20 Quintals.	Marcas per Real del Monte Mont, 30 Quintals.	Marcas per Guanajuato Monton, 32 Quintals.
oz. dec.	m. oz.	m. oz.	m. oz.	m. oz.	m. oz.
1	3	1.5	2	3	3.2
2	6	3.0	4	6	6.4
3	9	4.5	6	1 1	1 1.6
4	1.2	6.0	1 0	1 4	1 4.8
5	1.5	7.5	1 2	1 7	2 0
6	1.8	1 1	1 4	2 2	2 3.2
7	2.1	1 2.5	1 6	2 5	2 6.4
8	2.4	1 4	2 0	3 0	3 1.6
9	2.7	1 5.5	2 2	3 3	3 4.8
1 0	3	1 7	2 4	3 6	4 0
2 0	6	3 6	5 0	7 4	8 0
3 0	1 1	5 5	7 4	11 2	12 0
4 0	1 4	7 4	10 0	15 0	16 0
5 0	1 7	9 3	12 4	18 6	20 0
6 0	2 2	11 2	15 0	22 4	24 0
7 0	2 5	13 1	17 4	26 2	28 0
8 0	3 0	15 0	20 0	30 0	32 0
9 0	3 3	16 7	22 4	33 6	36 0
10 0	3 6	18 6	25 0	37 4	40 0
15 0	5 5	28 1	37 4	56 2	60 0
20 0	7 4	37 4	50 0	75 0	80 0
25 0	9 3	46 7	62 4	93 6	100 0
30 0	11 2	56 2	75 0	112 4	120 0
35 0	13 1	65 5	87 4	131 2	140 0
40 0	15 0	75 0	100 0	150 0	160 0
45 0	16 7	84 3	112 4	168 6	180 0
50 0	18 6	93 6	127 0	187 4	200 0

## WEIGHT of a SUPERFICIAL FOOT of various METALS in lbs.

Names.	Thickness by the Birmingham Wire Gauge.														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Iron.	12.50	12.00	11.00	10.00	8.74	8.12	7.50	6.86	6.24	5.62	5.00	4.38	3.75	3.12	2.82
Cop..	14.50	13.90	12.75	11.60	10.10	9.40	8.70	7.90	7.20	6.50	5.80	5.08	4.34	3.60	3.27
Brass	13.75	13.20	12.10	11.00	9.61	8.93	8.25	7.54	6.86	6.18	5.50	4.81	4.12	3.43	3.10

	Thickness by the Wire Gauge.														
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Iron.	2.50	2.18	1.86	1.70	1.54	1.40	1.25	1.12	1.00	.90	.80	.72	.64	.56	.5
Cop..	2.90	2.52	2.15	1.97	1.78	1.62	1.45	1.30	1.16	1.04	.92	.83	.74	.64	.58
Brass	2.75	2.40	2.04	1.87	1.69	1.54	1.37	1.23	1.10	.99	.88	.79	.70	.61	.55

	Thickness in parts of an Inch.										
	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	1
Iron.	2.5	5.	7.5	10.	12.5	15.	17.5	20.	25.	30.	40.
Cop..	2.9	5.8	8.7	11.6	14.5	17.4	20.3	23.2	28.9	34.7	46.2
Brass	2.7	5.5	8.2	10.9	13.6	16.3	19.0	21.8	27.1	32.5	43.3
Lead	3.7	7.4	11.1	14.8	18.5	22.2	25.9	29.6	37.0	44.4	59.2

The WEIGHT or PRESSURE which it is calculated a COLUMN of CAST IRON will sustain with safety.

Length or height in feet.	4	6	8	10	12	14	16	18	20	22	24
Diameter.	Weight in cwts.	Weight in cwts.	Weight in cwts.	Weight in cwts.	Weight in cwts.	Weight in cwts.	Weight in cwts.	Weight in cwts.	Weight in cwts.	Weight in cwts.	Weight in cwts.
In.											
2½	119	105	91	77	65	55	47	40	34	29	25
3	178	163	145	128	111	97	84	73	64	56	49
3½	247	232	214	191	172	156	135	119	106	94	83
4	326	310	288	266	242	220	198	178	160	144	130
4½	418	400	379	354	327	301	275	251	229	208	189
5	522	501	479	452	427	394	365	337	310	285	262
6	607	592	573	550	525	497	469	440	413	386	360
7	1032	1013	989	959	924	887	848	808	765	725	686
8	1333	1315	1289	1259	1224	1185	1142	1097	1052	1005	959
9	1716	1697	1672	1640	1603	1561	1515	1467	1416	1364	1311
10	2119	2100	2077	2045	2007	1964	1916	1865	1811	1755	1697
11	2570	2550	2520	2490	2450	2410	2358	2305	2248	2189	2127
12	3050	3040	3020	2970	2930	2900	2830	2780	2730	2670	2600

The relative strength of cast iron being assumed as 1—, steel will give 2.518, and wrought iron 1.745.



## WEIGHT of LEAD PIPES.

Bore, in Inches.	Length, in feet.	Weight of each Length, in lbs.		
		Common.	Middling.	Strong.
$\frac{1}{8}$	15	16		
$\frac{3}{8}$	15	24	27	30
1	15	30	40	43
$1\frac{1}{4}$	12	36	44	53
$1\frac{1}{2}$	12	48	56	67
2	10	56	70	83
$2\frac{1}{2}$	10	70	86	100

WEIGHT of COPPER PIPES, 12 Inches in Length and  $\frac{1}{8}$  of an Inch in the Knees.

	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.
Diameter of Bore....	$\frac{1}{8}$	$\frac{3}{8}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{3}{4}$	2	$2\frac{1}{2}$	3
Weight, in lbs.....	0·94	1·33	1·69	2·08	2·42	2·87	3·21	3·97	4·78

WEIGHT of A LINEAL FOOT of CAST-IRON PIPES,  
in POUNDS.

Diameter of bore, in inches.	Thickness of the Metal, in Inches.							
	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	1	$1\frac{1}{4}$	1	$1\frac{1}{2}$	$1\frac{3}{4}$
2	8·8	12·3	16·1	20·3				
$2\frac{1}{2}$	10·6	14·7	19·2	23·9				
3	12·4	17·2	22·2	27·6	33·3	39·3	45·6	
$3\frac{1}{2}$	14·2	19·6	25·3	31·3	37·6	44·2	51·1	
4	16·1	22·1	28·4	35·0	41·9	49·1	56·6	64·4
$4\frac{1}{2}$	18·0	24·5	31·4	38·7	46·2	54·0	62·1	70·6
5	19·8	27·0	34·5	42·3	50·5	58·9	67·6	76·7
$5\frac{1}{2}$	21·6	29·5	37·6	46·0	54·8	63·8	73·2	82·8
6	23·5	31·9	40·7	49·7	59·1	68·7	78·7	88·8
$6\frac{1}{2}$	25·3	34·4	43·7	53·4	63·4	73·4	84·2	95·1
7	27·2	36·8	46·8	56·8	67·7	78·5	89·7	101·2
$7\frac{1}{2}$	29·0	39·1	49·9	60·7	72·0	83·5	95·3	107·4
8	30·8	41·7	52·9	64·4	76·2	88·4	100·8	113·5
$8\frac{1}{2}$	32·9	44·4	56·2	68·3	80·8	93·5	106·5	119·9
9	34·5	46·6	59·1	71·8	84·8	98·2	111·8	125·8
$9\frac{1}{2}$	36·3	49·1	62·1	75·5	89·1	103·1	117·4	131·9
10	38·2	51·5	65·2	79·2	93·4	108·0	122·8	138·1
$10\frac{1}{2}$	..	54·0	68·2	82·8	97·7	112·9	128·4	144·2
11	..	56·4	71·3	86·5	102·0	117·8	133·9	150·3
$11\frac{1}{2}$	..	58·9	74·3	90·1	106·3	122·7	139·4	156·4
12	..	61·3	77·4	93·6	110·6	127·6	145·0	162·6
13	..	..	82·7	101·2	118·2	137·4	154·1	173·5
14	..	..	89·3	108·2	126·5	146·2	165·3	185·2
15	..	..	95·2	115·7	135·3	156·2	176·2	198·1
16	..	..	..	123·3	143·1	166·1	187·5	211·3
17	..	..	..	130·2	152·5	178·5	198·2	223·4
18	..	..	..	137·0	161·2	185·3	209·1	235·6
19	..	..	..	..	169·2	195·7	222·3	247·1
20	..	..	..	..	178·1	205·2	233·2	259·0

The two flanges of a pipe are considered as equal to the weight of one foot in length.

**PROGRESSIVE DILATATION of METALS by HEAT, the Length  
at 62° Fahrenheit being 1000000.**

Name of Metal.	At 212° Fahr.	At 662° Fahr.	Fusing Point.
Platinum .. .. .	1000735	1002995	1009926
Iron, wrought .. .. .	1000984	1004483	1018378
Iron, cast .. .. .	1000893	1003943	1016389
Gold .. .. .	1001025	1004238	
Copper .. .. .	1001430	1006347	1024376
Silver .. .. .	1001626	1006886	1020640
Zinc .. .. .	1002480	1008527	1012621
Lead .. .. .	1002323	..	1009072
Tin .. .. .	1001472	..	1003798

**POWER of METALS for CONDUCTING HEAT.**

Gold .. .. 1000	Platinum .. .. 381	Tin .. .. 303·9
Silver .. .. 973	Iron .. .. 374·3	Lead .. .. 179 6
Copper .. .. 898·2	Zinc .. .. 363	

**EFFECTS of HEAT on different METALS.**

	Fahr.	Wedg.		Fahr.	Wedg.
	Deg.	Deg.		Deg.	
Extrem. of Wedg- wood's Scale .. }	32277	240	Lead melts .. ..	612	
Platinum melts ..	23177	170	Mercury boils .. ..	600	
Wrought Iron fuses ..	21637	158	Bismuth melts .. ..	476	
Cast Iron melts ..	17977	130	Tin 1, and lead 4, melts	460	
Welding Heat of Bar Iron .. .. }	13420	94	Tin melts .. ..	442	
Fine Gold melts ..	5237	32	Tin 3, and lead 2, or tin 2, and bismuth 1, melts .. .. }	334	
Fine Silver melts ..	4717	28	Tin and bismuth, equal parts, melts }	283	
Copper melts .. ..	4587	27	Bismuth 5, tin 3, and lead 2, melts .. }	212	
Brass melts .. ..	3807	21			
Iron red-hot indaylight	1207	1			

**ORDER of METALS of DUCTILITY.**

Wire-drawing Ductility.†	Laminable Ductility.
Gold; Silver; Platinum; Iron, wrought; Copper; Zinc; Tin; Lead.	Gold; Silver; Copper; Tin; Platinum; Lead; Zinc; Iron, wrought.

**WEIGHT of MODULUS of ELASTICITY of various METALS.**

Metal.	Elasticity in lbs.	Metal.	Elasticity in lbs.
Steel .. .. .	29,000,000	Gun Metal .. .. .	9,873,000
Wrought Iron .. .. .	24 920,000	Brass .. .. .	8,930,000
Cast Iron .. .. .	18,400,000	Tin .. .. .	4,608,000
Zinc .. .. .	13,680,000	Lead .. .. .	720,000

*Note.*—The modulus of elasticity for oak is 1,714,500, and for cast iron 18,400,000, or 10·7 times that of oak; hence, cast iron is 10·7 times as stiff as a piece of oak of equal dimensions and bearing.

TABLE of SPECIFIC GRAVITY.

METALS.				STONES, EARTHS, &c.			
Names.	Weight, water being 1000.	Number of cubic inches in a lb.	Weight of a cubic inch, in lbs.	Names.	Weight, water being 1000.	Weight of a cubic foot, in lbs.	Number of cubic feet in a ton.
Platina .. ..	19500	1'417	'7053	Marble, average ..	2720	170'00	13
Pure Gold .. ..	19258	1'435	'6965	Granite, ditto ..	2651	165'68	13½
Mercury .. ..	13560	2'038	'4904	Purbeck Stone ..	2601	162'56	13¾
Lead .. ..	11352	2'435	'4105	Portland ditto ..	2570	160'62	14
Pure Silver .. ..	10474	2'638	'3788	Bristol ditto ..	2554	159'62	14
Bismuth .. ..	9823	2'814	'3552	Millstone .. ..	2484	155'25	14½
Copper, cast ..	8788	3'146	'3178	Paving Stone ..	2415	150'93	14½
— sheet .. ..	8910	3'103	'3225	Craigleith ditto ..	2362	147'62	15
Brass, cast ..	7824	3'533	'3036	Grindstone .. ..	2143	133'93	16½
— sheet .. ..	8396	3'293	'3037	Chalk, British ..	2781	173'81	12½
Iron, cast .. ..	7264	3'806	'263	Brick. . . . .	2000	125'00	17
— bar .. ..	7700	3'592	'279	Coal, Scotch ..	1300	81'15	27½
Steel, soft .. ..	7833	3'530	'2833	— Newcastle ..	1270	79'37	28½
— hard .. ..	7816	3'537	'2827	— Staffordshire..	1240	77'50	29
Tin, cast .. ..	7291	3'790	'2636	— Cannel .. ..	1238	77'37	29
Zinc, cast .. ..	7190	3'845	'26				

EXPANSION of SOLIDS by increasing the Temperature from 32° to 212°, the Length of the Bar being 1'0000000.

Glass tube .. ..	1'00082800	Gold .. ..	1'00150000
Platinum .. ..	1'00088420	Lead .. ..	1'00286700
Antimony .. ..	1'00108300	Brass .. ..	1'00186671
Cast Iron .. ..	1'00111111	Wrought Iron ..	1'00125800
Steel .. ..	1'00118999	Zinc .. ..	1'00294200
Blistered Steel ..	1'00112500	Spelter solder, brass 2, zinc 1	1'00205800
Steel, hardened ..	1'00122500	Soft solder, lead 2, tin 1 ..	1'00250800
Bismuth .. ..	1'00139200	Copper 8, tin 1 .. ..	1'00181700
Silver .. ..	1'00189000	Palladium .. ..	1'00100000
Tin .. ..	1'00217298		

EXPANSION and DENSITY of WATER at various Degrees of Temperature.

Sp. Gr.	Bulk of Water.	Maximum Density 39°.		Bulk of Water.	Sp. Gr.
		Deg.	Deg.		
1'00000	1'00000	38	40	1'00000	1'00000
0'99999	1'00001	37	41	1'00001	0'99999
0'99998	1'00002	36	42	1'00002	0'99998
0'99996	1'00004	35	43	1'00004	0'99996
0'99994	1'00006	34	44	1'00006	0'99994
0'99991	1'00008	33	45	1'00008	0'99991
0'99988	1'00012	32	46	1'00012	0'99988

*Note.*—The expansion of water is the same for any number of degrees above or below the maximum of density; but the law of maximum of density does not prevail in the case of sea-water, but, on the contrary, is found gradually to increase in weight down to the freezing point.

## RELATIVE STRENGTH of BODIES to RESIST TORSION.

Lead .. ..	1.0	Gun-metal .. ..	5.0	Blistered Steel ..	16.6
Tin .. ..	1.4	Cast Iron .. ..	9.0	Shear Steel .. ..	17.0
Copper .. ..	4.3	Swedish Iron ..	9.5	Cast Steel .. ..	19.5
Yellow Brass ..	4.6	English Iron ..	10.1		

## RELATIVE WEIGHT and STRENGTH of ROPES and CHAINS.

Circum. of Rope, in in.	Weight per fathom, in lbs.	Diameter of Chain, in in.	Weight per fathom, in lbs.	Proof strength in tons & cwt.	Circum. of Rope, in in.	Weight per fathom, in lbs.	Diameter of Chain, in in.	Weight per fathom, in lbs.	Proof strength in tons & cwt.
3½	2½	$\frac{5}{16}$	5½	1 5½	10	23	$\frac{7}{16}$	43	10 0
4½	4½	$\frac{3}{8}$	8	1 16½	10½	28	$\frac{15}{16}$	49	11 11
5	5½	$\frac{1}{8}$	10½	2 10	11½	30½	1	56	13 8
5½	7	$\frac{3}{8}$	14	3 5½	12½	36	$1\frac{1}{16}$	63	14 18
6½	9½	$\frac{1}{2}$	18	4 3½	13	39	$1\frac{3}{16}$	71	16 14
7	11½	$\frac{5}{8}$	22	5 2	13½	45	$1\frac{5}{16}$	79	18 11
8	15	$\frac{3}{4}$	27	6 4½	14½	48½	$1\frac{7}{16}$	87	20 8
8½	19	$\frac{7}{8}$	32	7 7	15½	56	$1\frac{9}{16}$	96	22 13
9½	21	$1\frac{1}{8}$	37	8 13½	16	60	$1\frac{5}{8}$	106	24 18

## COMPARATIVE STRENGTH, SIZE, and WEIGHT of IRON-WIRE ROPE, HEMPEN ROPE, and IRON CHAIN.

Breaking weight, in tons.	Description.	Size in inches.	Weight per fathom.
			lbs. oz.
4	Wire rope .. ..	1 circum.	0 12
	Hempen rope .. ..	2 do.	1 1
	Chain .. ..	$\frac{1}{4}$ diam.	3 0
8	Wire rope .. ..	2 circum.	2 10
	Hempen rope .. ..	5 do.	6 0
	Chain .. ..	$\frac{1}{2}$ diam.	16 0
12	Wire rope .. ..	2½ circum.	4 8
	Hempen rope .. ..	7 do.	12 3
	Chain .. ..	$\frac{3}{8}$ diam.	27 0
16	Wire rope .. ..	3 circum.	6 12
	Hempen rope .. ..	8 do.	14 3
	Chain .. ..	$\frac{1}{2}$ diam.	36 0
20	Wire rope .. ..	3½ circum.	9 4
	Hempen rope .. ..	9 do.	19 6
	Chain .. ..	$\frac{5}{8}$ diam.	46 0
24	Wire rope .. ..	4 circum.	12 4
	Hempen rope .. ..	10 do.	25 0
	Chain .. ..	$\frac{3}{4}$ diam.	53 0
30	Wire rope .. ..	4½ circum.	16 5
	Hempen rope .. ..	11 do.	30 0
	Chain .. ..	$1\frac{1}{8}$ diam.	62 0
36	Wire rope .. ..	5 circum.	22 5
	Hempen rope .. ..	12½ do.	35 10
	Chain .. ..	$1\frac{3}{8}$ diam.	78 0
44	Wire rope .. ..	5½ circum.	27 0
	Hempen rope .. ..	14 do.	41 10
	Chain .. ..	$1\frac{1}{2}$ diam.	96 0
54	Wire rope .. ..	6 circum.	34 0
	Hempen rope .. ..	15 do.	47 8
	Chain .. ..	$1\frac{7}{8}$ diam.	115 0



DEPTHS of SQUARE BARS of CAST IRON, calculated to support from 1 Cwt. to 14 Tons in the Centre, the Deflexion not exceeding one-fortieth of an Inch each Foot in Length.

Lengths in Feet.		10	12	14	16	18	20	22	24	26	28	30
Weight in cwt.	Weight in lbs.	Depth.	Depth.	Depth.	Depth.	Depth.	Depth.	Depth.	Depth.	Depth.	Depth.	Depth.
1 cwt.	112	In. 1'9	In. 2'0	In. 2'2	In. 2'4	In. 2'5	In. 2'6	In. 2'7	In. 2'9	In. 3'0	In. 3'1	In. 3'2
2	224	2'2	2'4	2'6	2'8	3'0	3'1	3'3	3'4	3'6	3'7	3'8
3	336	2'4	2'7	2'9	3'1	3'3	3'4	3'6	3'8	3'9	4'1	4'2
4	448	2'6	2'9	3'1	3'3	3'5	3'7	3'9	4'0	4'2	4'3	4'5
5	560	2'8	3'0	3'3	3'5	3'7	3'9	4'1	4'3	4'4	4'6	4'8
10	1,120	3'3	3'6	3'9	4'2	4'4	4'7	4'9	5'2	5'3	5'4	5'7
15	1,680	3'6	4'0	4'3	4'6	4'9	5'2	5'4	5'6	5'8	6'1	6'2
1 ton	2,240	3'9	4'3	4'6	4'9	5'2	5'5	5'8	6'0	6'3	6'5	6'8
1½	2,800	4'1	4'5	4'9	5'2	5'5	5'8	6'1	6'4	6'6	6'9	7'2
1¾	3,360	4'3	4'7	5'1	5'5	5'8	6'1	6'4	6'7	7'0	7'2	7'5
1½	3,920	4'5	4'9	5'3	5'7	6'0	6'3	6'7	6'9	7'2	7'5	7'7
2	4,480	4'7	5'1	5'5	5'9	6'2	6'5	6'8	7'2	7'6	7'7	8'0
2½	5,600	4'9	5'5	5'8	6'2	6'6	6'9	7'3	7'6	7'9	8'2	8'5
3	6,720	5'1	5'7	6'1	6'5	6'9	7'3	7'6	7'9	8'3	8'6	8'9
3½	7,840	5'3	5'8	6'3	6'7	7'1	7'5	7'9	8'2	8'6	8'9	9'2
4	8,960	5'5	6'0	6'5	7'0	7'4	7'8	8'2	8'5	8'9	9'2	9'5
5	11,200	5'8	6'4	6'9	7'4	7'8	8'2	8'6	9'0	9'4	9'7	10'1
6	13,440	6'1	6'7	7'2	7'7	8'2	8'6	9'0	9'4	9'8	10'2	10'5
7	15,680	6'3	6'9	7'5	8'0	8'5	8'9	9'4	9'8	10'2	10'6	11'0
8	17,920	6'6	7'2	7'8	8'3	8'8	9'3	9'7	10'1	10'6	10'9	11'3
9	20,160	6'8	7'4	8'0	8'5	9'0	9'5	10'0	10'4	10'9	11'3	11'7
10	22,400	6'9	7'6	8'2	8'8	9'3	9'8	10'3	10'7	11'2	11'6	12'0
15	33,600	7'7	8'4	9'1	9'7	10'3	10'8	11'4	12'3	12'8	13'2	13'7
20	44,800	..	9'0	9'7	10'4	11'0	11'6	12'5	12'7	13'2	13'8	14'2
30	67,200	..	..	10'8	11'5	12'2	12'9	13'5	14'1	14'7	15'2	15'7
40	89,600	..	..	..	12'4	13'1	13'8	14'5	15'1	15'7	16'4	16'9
50	112,000	..	..	..	..	13'8	14'6	15'3	16'0	16'6	17'3	17'9
60	134,000	..	..	..	..	14'5	15'3	16'0	16'7	17'4	18'1	18'7
Deflexion in inches		*25	*3	*35	*4	*45	*5	*55	*6	*65	*7	*75

*Examples.*—1. To find the depth of a rectangular bar of cast iron to support a weight of 10 tons in the middle of its length, the deflexion not to exceed  $\frac{1}{40}$  of an inch per foot in length, and its length 20 feet, also let the depth be 6 times the breadth.

Opposite 6 times the weight and under 20 feet in length is 15'3 inches the depth, and  $\frac{1}{6}$  of 15'3 = 2'6 inches the breadth.

2. To find the diameter for a cast-iron shaft or solid cylinder that will bear a given pressure, the flexure in the middle not to exceed  $\frac{1}{40}$  of an inch for each foot of its length, the distance of the bearings being 20 feet, and the pressure on the middle equals 10 tons.

Constant multiplier 1'7 for round shafts, then  $10 \times 1'7 = 17$ . And opposite 17 tons and under 20 feet is 11'2 inches for the diameter.

But half that flexure is quite enough for revolving shafts: hence  $17 \times 2 = 34$  tons; and opposite 34 tons is 13'3 inches for the diameter.

The above calculations of the strength of cast-iron bars are founded on experiments by Mr. Hodgkinson, of Manchester, and are extracted from his new edition of Tredgold.—(*Abstract of Table, Weale's Engineer's Pocket-book.*)

## WEIGHT of a LINEAL FOOT of FLAT BAR IRON, in lbs.

Breadth in inches.	Thickness, in parts of an inch.								
	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1
1	.835	1.044	1.253	1.461	1.670	2.088	2.506	2.923	3.340
1 $\frac{1}{8}$	.939	1.174	1.409	1.644	1.878	2.348	2.818	3.287	3.756
1 $\frac{1}{4}$	1.044	1.305	1.566	1.826	2.088	2.609	3.132	3.653	4.176
1 $\frac{3}{8}$	1.148	1.435	1.722	2.009	2.296	2.870	3.444	4.018	4.592
1 $\frac{1}{2}$	1.252	1.566	1.879	2.192	2.504	3.131	3.758	4.384	5.008
1 $\frac{5}{8}$	1.358	1.696	2.035	2.374	2.716	3.392	4.070	4.749	5.432
1 $\frac{3}{4}$	1.462	1.827	2.192	2.557	2.924	3.653	4.384	5.114	5.848
1 $\frac{7}{8}$	1.566	1.957	2.348	2.740	3.132	3.914	4.696	5.479	6.264
2	1.671	2.088	2.505	2.922	3.342	4.175	5.010	5.845	6.684
2 $\frac{1}{8}$	1.775	2.218	2.662	3.105	3.550	4.435	5.324	6.210	7.100
2 $\frac{1}{4}$	1.880	2.348	2.818	3.288	3.760	4.696	5.636	6.575	7.520
2 $\frac{3}{8}$	1.984	2.479	2.975	3.470	3.968	4.957	5.950	6.941	7.936
2 $\frac{1}{2}$	2.088	2.609	3.131	3.653	4.176	5.218	6.262	7.306	8.352
2 $\frac{5}{8}$	2.193	2.740	3.288	3.836	4.386	5.479	6.576	7.671	8.772
2 $\frac{3}{4}$	2.297	2.870	3.444	4.018	4.594	5.740	6.888	8.036	9.188
2 $\frac{7}{8}$	2.402	3.001	3.601	4.201	4.804	6.001	7.202	8.402	9.608
3	2.506	3.131	3.758	4.384	5.012	6.262	7.516	8.767	10.024

## WEIGHT of a LINEAL FOOT of SQUARE and ROUND BAR IRON.

Side & diameter, in inches.	Square, in lbs.	Number of lineal feet in 1 cwt.	Round, in lbs.	Number of lineal feet in 1 cwt.	Side & diameter, in inches.	Square, in lbs.	Number of lineal feet in 1 cwt.	Round, in lbs.	Number of lineal feet in 1 cwt.
$\frac{1}{4}$	.209	536	.164	683	$3\frac{1}{8}$	32.618	$3\frac{1}{2}$	25.620	$4\frac{1}{4}$
$\frac{1}{8}$	.326	343 $\frac{1}{2}$	.256	437 $\frac{1}{2}$	$3\frac{3}{8}$	35.279	3	27.709	4
$\frac{3}{16}$	.470	238	.369	303 $\frac{1}{2}$	$3\frac{5}{8}$	38.045	3	29.881	$3\frac{3}{4}$
$\frac{1}{4}$	.640	175	.503	224 $\frac{1}{2}$	$3\frac{7}{8}$	40.916	$2\frac{3}{4}$	32.170	$3\frac{1}{4}$
$\frac{5}{16}$	.835	134	.656	170 $\frac{3}{4}$	$3\frac{9}{8}$	43.890	$2\frac{1}{2}$	34.472	$3\frac{1}{8}$
$\frac{3}{8}$	1.057	106	.881	134 $\frac{1}{2}$	$3\frac{11}{8}$	46.969	$2\frac{1}{4}$	36.895	3
$\frac{1}{2}$	1.305	86	1.025	109 $\frac{1}{2}$	$3\frac{13}{8}$	50.153	$2\frac{1}{8}$	39.390	$2\frac{3}{4}$
$\frac{5}{8}$	1.579	71	1.241	90 $\frac{1}{2}$	4	53.440	2	41.984	$2\frac{1}{2}$
$\frac{3}{4}$	1.879	59 $\frac{1}{2}$	1.476	76	$4\frac{1}{8}$	56.833	2	44.637	$2\frac{1}{4}$
$\frac{7}{8}$	2.205	51	1.732	64 $\frac{1}{2}$	$4\frac{3}{8}$	60.329	$1\frac{3}{4}$	47.385	$2\frac{1}{8}$
1	2.558	44	2.011	55 $\frac{1}{2}$	$4\frac{5}{8}$	63.930	$1\frac{1}{2}$	50.211	$2\frac{1}{4}$
$1\frac{1}{8}$	2.936	38	2.306	48 $\frac{1}{2}$	$4\frac{7}{8}$	67.637	$1\frac{1}{4}$	53.132	$2\frac{1}{8}$
$1\frac{1}{4}$	3.340	33 $\frac{1}{2}$	2.624	42 $\frac{1}{2}$	$4\frac{9}{8}$	71.445	$1\frac{1}{8}$	56.113	2
$1\frac{1}{8}$	4.228	26 $\frac{1}{2}$	3.321	33 $\frac{3}{4}$	$4\frac{11}{8}$	75.359	$1\frac{1}{8}$	59.187	$1\frac{3}{4}$
$1\frac{3}{8}$	5.219	21 $\frac{1}{2}$	4.099	27 $\frac{1}{2}$	$4\frac{13}{8}$	79.378	$1\frac{1}{4}$	62.344	$1\frac{1}{2}$
$1\frac{1}{2}$	6.315	17 $\frac{1}{2}$	4.961	22 $\frac{1}{2}$	5	83.510	$1\frac{1}{4}$	65.585	$1\frac{1}{4}$
$1\frac{3}{4}$	7.516	15	5.913	19	$5\frac{1}{8}$	92.459	$1\frac{1}{4}$	72.618	$1\frac{1}{4}$
$1\frac{7}{8}$	8.820	12 $\frac{3}{4}$	6.928	16 $\frac{1}{2}$	$5\frac{3}{8}$	101.036	$1\frac{1}{8}$	79.370	$1\frac{1}{4}$
$1\frac{1}{2}$	10.229	11	8.043	14	$5\frac{5}{8}$	110.429	1	86.731	$1\frac{1}{4}$
2	11.743	9 $\frac{1}{2}$	9.224	12 $\frac{1}{2}$	6	120.243		94.610	$1\frac{1}{8}$
2 $\frac{1}{8}$	13.360	8 $\frac{1}{2}$	10.496	10 $\frac{1}{2}$					
2 $\frac{1}{4}$	15.083	7 $\frac{1}{2}$	11.846	9 $\frac{1}{2}$					
2 $\frac{3}{8}$	16.909	6 $\frac{3}{4}$	13.283	8 $\frac{1}{2}$					
2 $\frac{1}{2}$	18.840	6	14.797	7 $\frac{1}{2}$					
2 $\frac{5}{8}$	20.875	5 $\frac{1}{4}$	16.396	6 $\frac{3}{4}$					
2 $\frac{3}{4}$	23.115	5	18.146	6 $\frac{1}{4}$					
2 $\frac{7}{8}$	25.559	4 $\frac{1}{2}$	19.842	5 $\frac{1}{2}$					
3	27.608	4	21.684	5 $\frac{1}{8}$					
	30.070	3 $\frac{3}{4}$	23.653	4 $\frac{3}{4}$					

NOTE.—The weight of bar iron being 1 ;

The weight of cast iron = .95  
 — steel = 1.02  
 — copper = 1.16  
 — brass = 1.09  
 — lead = 1.48

TABLE of the WEIGHT of TIN PLATES as manufactured in England.

Brand Mark.		Number of Sheets per Box.	Length and Breadth.		Weight per Box.		
			In.	In.	cwt.	qrs.	lbs.
One Box of	1 C or 1 Com. ..	225	13 $\frac{1}{2}$	by 10	1	0	0
	2 C .. ..	225	13 $\frac{1}{2}$	" 9 $\frac{1}{2}$	0	3	21
	3 C .. ..	225	12 $\frac{1}{2}$	" 9 $\frac{1}{2}$	0	3	14
	H C .. ..	225	13 $\frac{1}{2}$	" 10	1	0	7
	H X .. ..	225	13 $\frac{1}{2}$	" 10	1	1	7
	1 X .. ..	225	13 $\frac{1}{2}$	" 10	1	1	0
	2 X .. ..	225	13 $\frac{1}{2}$	" 9 $\frac{1}{2}$	1	0	21
	3 X .. ..	225	12 $\frac{1}{2}$	" 9 $\frac{1}{2}$	1	0	14
	1 XX .. ..	225	13 $\frac{1}{2}$	" 10	1	1	21
	1 XXX .. ..	225	13 $\frac{1}{2}$	" 10	1	2	14
	1 XXXX .. ..	225	13 $\frac{1}{2}$	" 10	1	3	7
	DC .. ..	100	16 $\frac{1}{2}$	" 12 $\frac{1}{2}$	0	3	21
	DX .. ..	100	16 $\frac{1}{2}$	" 12 $\frac{1}{2}$	1	0	14
	DXX .. ..	100	16 $\frac{1}{2}$	" 12 $\frac{1}{2}$	1	1	7
	DXXX .. ..	100	16 $\frac{1}{2}$	" 12 $\frac{1}{2}$	1	2	0
	DXXXX .. ..	100	16 $\frac{1}{2}$	" 12 $\frac{1}{2}$	1	2	21
	SDC .. ..	200	15	" 11	1	2	0
	SDX .. ..	200	15	" 11	1	2	21
	SDXX .. ..	200	15	" 11	1	3	14
	SDXXX .. ..	200	15	" 11	2	0	7
	SDXXXX .. ..	200	15	" 11	2	1	0
	Wasters or Wc and X mixed .. ..	215	13 $\frac{1}{2}$	" 10	1	0	14
	TT .. ..	450	13 $\frac{1}{2}$	" 10	1	0	0
	XTT .. ..	450	13 $\frac{1}{2}$	" 10	1	0	14

CUBICAL CONTENTS of 11-inch Planks, 9-Inch Deals, and 7-inch Battens, of 2 $\frac{1}{2}$  and 3 Inches in thickness.

Length in feet.	Planks, 11 by 2 $\frac{1}{2}$ in.	Planks 11 by 3 in.	Deals, 9 by 2 $\frac{1}{2}$ in.	Deals, 9 by 3 in.	Battens, 7 by 2 $\frac{1}{2}$ in.	Battens, 7 by 3 in.
	ft. in. pts.	ft. in. pts.	ft. in. pts.	ft. in. pts.	ft. in. pts.	ft. in. pts.
8	1 6 4	1 10 0	1 3 0	1 6 0	0 11 8	1 2 0
10	1 10 11	2 3 6	1 6 9	1 10 6	1 2 7	1 5 6
12	2 3 6	2 9 0	1 10 6	2 3 0	1 5 6	1 9 0
14	2 8 1	3 2 6	2 2 3	2 7 6	1 8 5	2 0 6
16	3 0 8	3 8 0	2 6 0	3 0 0	1 11 4	2 4 0
18	3 5 3	4 1 6	2 9 9	3 4 6	2 2 3	2 7 6
20	3 9 10	4 7 0	3 1 6	3 9 0	2 5 2	2 11 0
Number of each to equal a Load of 50 cubic feet.						
8	32 $\frac{3}{4}$	27 $\frac{1}{4}$	40	33 $\frac{1}{2}$	51 $\frac{1}{2}$	43
10	26 $\frac{1}{4}$	22	32	26 $\frac{3}{4}$	41 $\frac{1}{4}$	34 $\frac{3}{4}$
12	22	18 $\frac{1}{4}$	26 $\frac{3}{4}$	22 $\frac{1}{4}$	34 $\frac{1}{4}$	28 $\frac{3}{4}$
14	18 $\frac{3}{4}$	15 $\frac{1}{2}$	23	19	29 $\frac{1}{2}$	24 $\frac{1}{2}$
16	16 $\frac{1}{4}$	13 $\frac{3}{4}$	20	16 $\frac{3}{4}$	25 $\frac{3}{4}$	21 $\frac{1}{2}$
18	14 $\frac{1}{2}$	12 $\frac{1}{4}$	17 $\frac{3}{4}$	15	23	19
20	13	11	16	13 $\frac{1}{2}$	20 $\frac{3}{4}$	16 $\frac{3}{4}$

TABLE of the AREAS of CYLINDERS.

Diameter of Cylinder.	Area of Cylinder.	Diameter of Cylinder.	Area of Cylinder.
Inches.	Square Inches.	Inches.	Square Inches.
9	63·58	12½	122·65
10	78·5	13	132·66
10½	86·56	13	143·02
11	95·01	14	153·96
11½	103·84	14½	165·04
12	113·07	15	176·62

*Note.*—The areas of cylinders are as the squares of their diameters.

The diameter of a circle being 1, its circumference equals 3·1416.

The square of the diameter of a circle being 1, its area equals ·7854.

The circumference of a cylinder, multiplied by its length or height, equals its convex surface.

The area of the end of a cylinder, multiplied by its length, equals its solid contents.

The area of the internal diameter of a cylinder, multiplied by its depth, equals its cubical capacity.

The square of the diameter of a cylinder, multiplied by its length and divided by any other required length, the square root of the quotient equals the diameter of the other cylinder of equal contents or capacity.

The capacity of a cylinder 1 foot in diameter and 1 foot in length, equals 4·895 imperial gallons.

The capacity of a cylinder 1 inch in diameter and 1 foot in length, equals ·034 of an imperial gallon.

The capacity of a cylinder 1 inch in diameter and 1 inch in length, equals ·002832 of an imperial gallon.

The capacity of any cylinder in imperial gallons is obtained by multiplying the square of its diameter by its length, or the capacity of any other sphere by the cube of its diameter, and by the number of imperial gallons contained as above in the unity of its measurement.

TABLE of the PROPORTIONS of HEATING SURFACE and AREA of FIRE-GRATE compared with the quantity of water evaporated, and of fuel consumed, in the Cornish and Boulton and Watt boilers.

	Place.	Number of boilers.	Boiler surface exposed to fire and flues.			Weight of fuel burnt per square foot of grate per hour.
			Per square foot of fire-grate.	Per lb. of water evaporated per hour.	Per lb. of fuel consumed per hour.	
Boulton & Watt boilers	Albion Mills....	1	sq. ft. 21·28	sq. ft. 0·15	sq. ft. 1·294	lbs. 16·44
	Old Ford .....	1	15·78	0·163	1·3	12·21
Cornish boilers	Wheal Towan..	3	36·11	1·205	12·75	2·83
	United Mines...	3	43·88	1·022	10·72	4·09
	Old Ford .....	4	43·7	1·56	13·1	3·64

By this table it appears, that in the Cornish boiler,

1st. The ratio of the area of the heating surface to that of the fire-grate is more than twice as great as in the common boiler.

2nd. The proportion of heating surface to the quantity of water evaporated, or of fuel consumed, in a given time, is about ten times as great.

3rd. The rate of combustion is slower with the Cornish boiler than with the common one, in the proportion of about 1 to 4.

One pound of steam will raise 3,657 cubic feet of air 10°, and cause it to expand from 32° to 42°, about 3,733 cubic feet.

The heat that would raise 1 pound of water 1° would raise a pound of air 3·7°:—one pound of air = about 11 cubic feet.—(*Weale's Engineer's Pocket-Book.*)



TABLE of GRADIENTS.

Rise		Inclina- tion.	Rise		Inclina- tion.	Rise		Inclina- tion.
Per mile.	Per chain.		Per mile.	Per chain.		Per mile.	Per chain.	
ft.	in.	1 in.	ft.	in.	1 in.	ft.	in.	1 in.
1	·15	5280	21	3·15	251·4	41	6·15	128·8
2	·30	2640	22	3·30	240	42	6·30	125·7
3	·45	1760	23	3·45	229·5	43	6·45	122·8
4	·60	1320	24	3·60	220	44	6·60	120
5	·75	1056	25	3·75	211·2	45	6·75	117·3
6	·90	880	26	3·90	203·1	46	6·90	114·8
7	1·05	754·2	27	4·05	195·5	47	7·05	112·3
8	1·20	660	28	4·20	188·6	48	7·20	110
9	1·35	586·6	29	4·35	182·1	49	7·35	107·7
10	1·50	528	30	4·50	176	50	7·50	105·6
11	1·65	480	31	4·65	170·3	51	7·65	103·5
12	1·80	440	32	4·80	165	52	7·80	101·5
13	1·95	406·1	33	4·95	160	53	7·95	99·6
14	2·10	377·1	34	5·10	155·3	54	8·10	97·8
15	2·25	352	35	5·25	150·8	55	8·25	96
16	2·40	330	36	5·40	146·6	56	8·40	94·3
17	2·55	310·6	37	5·55	142·7	57	8·55	92·6
18	2·70	293·3	38	5·70	138·9	58	8·70	91
19	2·85	277·9	39	5·85	135·4	59	8·85	89·5
20	3·00	264	40	6·00	132	60	9·00	88

## MAGNETIC DECLINATION, or VARIATION of the COMPASS.

Two volumes of the Greenwich Magnetical and Meteorological Observations for the years 1845 and 1846 have been published, from which it appears that the following were the monthly values of the westerly declination, deduced from two-hourly observations made during the day and night, in the years 1845 and 1846.

1845.				1846.			
January	..	..	22° 58' 6"	January	..	..	22° 50' 56"
February	..	..	22 57 20	February	..	..	22 50 17
March	..	..	22 57 6	March	..	..	22 49 21
April..	..	..	22 59 14	April..	..	..	22 51 51
May..	..	..	22 57 28	May..	..	..	22 49 32
June..	..	..	23 1 10	June..	..	..	22 51 48
July..	..	..	22 57 24	July..	..	..	22 49 24
August	..	..	22 58 11	August	..	..	22 49 33
September	..	..	22 56 7	September	..	..	22 48 55
October	..	..	22 53 21	October	..	..	22 47 55
November	..	..	22 52 53	November	..	..	22 47 38
December	..	..	22 52 18	December	..	..	22 47 51

The mean westerly declination for the year 1845 was 22° 56' 43", and that for the year 1846 was 22° 49' 35". The decrease from the year 1844 to 1845 was 18' 36"; and that from the year 1845 to 1846 was 7' 8".

## COMPARATIVE TABLE OF WEIGHTS AND MEASURES.

The NEWCASTLE STATUTE COAL MEASURE converted into WEIGHT.      The LONDON IMPERIAL COAL MEASURE converted into WEIGHT.

Chals.	Tons. Cwt.	Chals.	Tons. Cwt.	Chals.	Tons. Cwt.	Chals.	Tons. Cwt.	Chals.	Tons. Cwt.	Chals.	Tons. Cwt.	Chals.	Tons. Cwt.	Chals.	Tons. Cwt.	Chals.	Tons. Cwt.	Chals.	Tons. Cwt.	Chals.	Tons. Cwt.
1	2 13	33	87 9	65	172 5	97	257 1	1	5½	33	42 1½	65	82 17½	97	123 13½						
2	5 6	34	90 2	66	174 18	98	259 14	2	11	34	43 7	66	84 3	98	124 19						
3	7 19	35	92 15	67	177 11	99	262 7	3	16½	35	44 12½	67	85 8½	99	126 4½						
4	10 12	36	95 8	68	180 4	100	265 0	4	5 2	36	45 18	68	86 14	100	127 10						
5	13 5	37	98 1	69	182 17	101	267 13	5	6 7½	37	47 3½	69	87 19½	101	128 15½						
6	15 18	38	100 14	70	185 10	102	270 6	6	7 13	38	48 9	70	89 5	102	130 1						
7	18 11	39	103 7	71	188 3	103	272 19	7	8 18½	39	49 14½	71	90 10½	103	131 6½						
8	21 4	40	106 0	72	190 16	104	275 12	8	10 4	40	51 0	72	91 16	104	132 12						
9	23 17	41	108 13	73	193 9	105	278 5	9	11 9½	41	52 5½	73	93 1½	105	133 17½						
10	26 10	42	111 6	74	196 2	106	280 18	10	12 15	42	53 11	74	94 7	106	135 3						
11	29 3	43	113 19	75	198 15	107	283 11	11	14 0½	43	54 16½	75	95 12½	107	136 8½						
12	31 16	44	116 12	76	201 8	108	286 4	12	15 6	44	56 2	76	96 18	108	137 14						
13	34 9	45	119 5	77	204 1	109	288 17	13	16 11½	45	57 7½	77	98 3½	109	138 19½						
14	37 2	46	121 18	78	206 14	110	291 10	14	17 17	46	58 13	78	99 9	110	140 5						
15	39 15	47	124 11	79	209 7	111	294 3	15	19 2½	47	59 18½	79	100 14½	111	141 10½						
16	42 8	48	127 4	80	212 0	112	296 16	16	20 8	48	61 4	80	102 0	112	142 16						
17	45 1	49	129 17	81	214 13	113	299 9	17	21 13½	49	62 9½	81	103 5½	113	144 1½						
18	47 14	50	132 10	82	217 6	114	302 2	18	22 19	50	63 15	82	104 11	114	145 7						
19	50 7	51	135 3	83	219 19	115	304 15	19	24 4½	51	65 0½	83	105 16½	115	146 12½						
20	53 0	52	137 16	84	222 12	116	307 8	20	25 10	52	66 6	84	107 2	116	147 18						
21	55 13	53	140 9	85	225 5	117	310 1	21	26 15½	53	67 11½	85	108 7½	117	149 3½						
22	58 6	54	143 2	86	227 18	118	312 14	22	28 1	54	68 17	86	109 13	118	150 9						
23	60 19	55	145 15	87	230 11	119	315 7	23	29 6½	55	70 2½	87	110 18½	119	151 14½						
24	63 12	56	148 8	88	233 4	120	318 0	24	30 12	56	71 8	88	112 4	120	153 0						
25	66 5	57	151 1	89	235 17	125	331 5	25	31 17½	57	72 13½	89	113 9½	125	159 7½						
26	68 18	58	153 14	90	238 10	130	344 10	26	33 3	58	73 19	90	114 15	130	165 15						
27	71 11	59	156 7	91	241 3	135	357 15	27	34 8½	59	75 4½	91	116 0½	135	172 2½						
28	74 4	60	159 0	92	243 16	140	371 0	28	35 14	60	76 10	92	117 6	140	178 10						
29	76 17	61	161 13	93	246 9	145	384 5	29	36 5	61	77 15½	93	118 11½	145	184 17½						
30	79 10	62	164 6	94	249 2	150	397 10	30	38 10½	62	79 1	94	119 17	150	191 5						
31	82 3	63	166 19	95	251 15			31	39 10½	63	80 6½	95	121 2½								
32	84 16	64	169 12	96	254 8			32	40 16	64	81 12	96	122 8								

## RELATIVE PRICES OF COALS.

£ Ton 20 cwt.	£ Imp. Chal. 25½ cwt.	£ New. Chal. 53 cwt.	£ Ton 20 cwt.	£ Imp. Chal. 25½ cwt.	£ New. Chal. 53 cwt.
s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1 0	1 3'30	2 7'80	10 9	13 8'47	28 5'85
1 3	1 7'12	3 3'75	11 0	14 0'30	29 1'80
1 6	1 10'95	3 11'70	11 3	14 4'12	29 9'75
1 9	2 2'77	4 7'65	11 6	14 7'95	30 5'70
2 0	2 6'60	5 3'60	11 9	14 11'77	31 1'65
2 3	2 10'42	5 11'55	12 0	15 3'60	31 9'60
2 6	3 2'25	6 7'50	12 3	15 7'42	32 5'55
2 9	3 6'07	7 3'45	12 6	15 11'25	33 1'50
3 0	3 9'90	7 11'40	12 9	16 3'07	33 9'45
3 3	4 1'72	8 7'35	13 0	16 6'90	34 5'40
3 6	4 5'55	9 3'30	13 3	16 10'72	35 1'35
3 9	4 9'37	9 11'25	13 6	17 2'55	35 9'30
4 0	5 1'20	10 7'20	13 9	17 6'37	36 5'25
4 3	5 5'02	11 3'15	14 0	17 10'20	37 1'20
4 6	5 8'85	11 11'10	14 3	18 2'02	37 9'15
4 9	6 0'67	12 7'05	14 6	18 5'85	38 5'10
5 0	6 4'50	13 3'00	14 9	18 9'67	39 1'05
5 3	6 8'32	13 10'95	15 0	19 1'50	39 9'00
5 6	7 0'15	14 6'90	15 3	19 5'32	40 4'95
5 9	7 3'97	15 2'85	15 6	19 9'15	41 0'90
6 0	7 7'80	15 10'80	15 9	20 0'97	41 8'85
6 3	7 11'62	16 6'75	16 0	20 4'80	42 4'80
6 6	8 3'45	17 2'70	16 3	20 8'62	43 0'75
6 9	8 7'27	17 10'65	16 6	21 0'45	43 8'70
7 0	8 11'10	18 6'60	16 9	21 4'27	44 4'65
7 3	9 2'92	19 2'55	17 0	21 8'10	45 0'60
7 6	9 6'75	19 10'50	17 3	21 11'92	45 8'55
7 9	9 10'57	20 6'45	17 6	22 3'75	46 4'50
8 0	10 2'40	21 2'40	17 9	22 7'57	47 0'45
8 3	10 6'22	21 10'35	18 0	22 11'40	47 8'40
8 6	10 10'05	22 6'30	18 3	23 3'22	48 4'35
8 9	11 1'87	23 2'25	18 6	23 7'05	49 0'30
9 0	11 5'70	23 10'20	18 9	23 10'87	49 8'25
9 3	11 9'52	24 6'15	19 0	24 2'70	50 4'20
9 6	12 1'35	25 2'10	19 3	24 6'52	51 0'15
9 9	12 5'17	25 10'05	19 6	24 10'35	51 8'10
10 0	12 9'00	26 6'00	19 9	25 2'17	52 4'05
10 3	13 0'82	27 1'95	20 0	25 6'00	53 0'00
10 6	13 4'65	27 9'90			

## STANDARD, PRODUCE, AND PRICE OF COPPER ORES.

The Standard not being generally understood, or the rule whereby the price of ore, of a given produce sold at a certain standard, can be ascertained, as well as the standard at which ore sells, the produce and price of which are given, we are induced to give the following form, which is in itself so simple as to require no explanatory remarks:—

To ascertain the price per ton of Copper Ore the produce of which by assay is 8½, at the standard of £94. 8s. multiply the given standard by the produce; thus, £94. 8s. × 8½ = £836, and which divided by 100, gives £8. 7s. 2d. as the rate or price per ton, from which deduct returning charges, £2. 15s., leaving £5. 12s. 2d. as the actual price realized.

To determine the standard at which Ore sells, the price being £5. 17s. 6d. per ton, and the produce 9½, add to the price, £5. 17s. 6d., the returning charges of £2. 15s., which give a total of £8. 12s. 6d. Then, as 9½ : £8. 12s. 6d. :: 100 to the required standard, or £93. 4s. 10½d.

## ALLOYS and COMPOSITIONS

*Chinese White Copper*.—40·4 parts copper, 31·6 nickel, 25·4 zinc, and 2·6 iron.

*German Silver*.—1 part nickel, 1 zinc, and 2 copper; when intended for rolling into plates, 25 nickel, 20 zinc, and 60 copper, to which may be added 3 of lead.

*Manheim Gold*.—3 parts copper, 1 zinc, and a small quantity of tin.

*Alloy of the Standard Measures used by Government*.—576 parts copper, 59 tin, and 48 brass.

*Bath Metal*.—32 parts brass, 9 parts zinc.

*Speculum Metal*.—6 parts copper, 2 parts tin, and 1 of arsenic; or, 7 of copper, 3 of zinc, and 4 of tin.

*Hard Solder*.—2 parts copper and 1 part zinc.

*Blanched Copper*.—8 parts of copper and  $\frac{1}{2}$  part arsenic.

*Britannia Metal*.—4 parts of brass and 4 of tin; when fused, add 4 of bismuth and 4 of antimony. This composition is added at discretion to melted tin.

*Plumber's Solder*.—Equal parts of lead and tin.

*Tinman's Solder*.—2 parts of lead and 1 of tin.

*Pewterer's Solder*.—2 parts of tin and 1 of lead.

*Common Pewter*.—4 parts of tin and 1 of lead.

*Best Pewter*.—100 parts of tin and 17 of antimony.

*A Metal that expands in cooling*.—9 parts of lead, 2 of antimony, and 1 of bismuth. This metal is very useful in filling small defects in iron castings, &c.

*Queen's Metal*.—9 parts of tin, 1 of antimony, 1 of bismuth, and 1 of lead.

*Muck Platinum*.—8 parts of brass and 5 of zinc.

*Silver Coin of Britain*.— $11\frac{1}{10}$  pure silver and  $9\frac{9}{10}$  copper.

*Gold Coin of Britain*.—11 parts pure gold and 1 copper. Previous to 1826, silver formed part of the alloy of gold coin; hence the different colour of our gold money.

*Ring Gold*.—6 dwts. 12 grains pure copper, 3 dwts. 16 grains fine silver, and 1 oz. 5 dwts. pure gold.

*Mock Gold*.—Fuse together 16 parts of copper, 7 of platinum, and 1 of zinc. When steel is alloyed with  $\frac{1}{500}$  part of platinum, or with  $\frac{1}{500}$  part of silver, it is rendered much harder, more malleable, and better adapted for every kind of cutting instrument.

**NOTE**.—In making alloys, care must be taken to have the more infusible metals melted first, and afterwards add the others.

*Composition used in welding Cast Steel*.—Take of borax 10 parts, sal-ammoniac 1 part; grind or pound them roughly together; then fuse them in a metal pot over a clear fire, taking care to continue the heat until all spume has disappeared from the surface. When the liquid appears clear, the composition is ready to be poured out to cool and concrete; afterwards, being ground to a fine powder, it is ready for use.

To use this composition, the steel to be welded is raised to a heat which may be expressed by "bright yellow," it is then dipped among the welding powder and again placed in the fire until it attains the same degree of heat as before; it is then ready to be placed under the hammer.

*Cast-Iron Cement*.—Take of clean borings or turnings of cast iron 16 parts, of sal-ammoniac 2 parts, and flour of sulphur 1 part; mix them well together in a mortar and keep them dry. When required for use, take 1 part of the mixture and 20 parts of clean borings, mix thoroughly, and add a sufficient quantity of water.

**NOTE**.—A little grindstone-dust added improves the cement.

*Booth's Patent Grease for Railway Axles*.—Water 1 gallon, clean tallow 3 lbs., palm-oil 6 lbs., common soda  $\frac{1}{2}$  lb.; or tallow 8 lbs., and palm-oil 10 lbs. The mixture to be heated to about 210° F., and well stirred till it cools down to about 70°, when it is ready for use.

*Cement for Steam-pipe Joints, &c. with faced flanges*.—To 2 parts of white lead mixed add 1 part red lead dry, grind or otherwise mix them to a consistence of thin putty, apply interposed layers with one or two thicknesses of canvass or gauze wire, as the necessity of the case may be.—(*Weale's Engineer's Pocket-Book*.)



# TABLE of ALLOYS, SOLDERS, and AMALGAMS, EMPLOYED in the ARTS.

BY M. CHAUDET, ASSAYER OF THE MINT, PARIS.

## ALLOYS.

Gold coin—French standard	.. ..	Gold 900, copper 100.
Silver coin ditto	.. ..	Silver 900, copper 100.
Billon ditto	.. ..	Copper 800, silver 200.
Gold medals ditto	.. ..	Gold, 916, copper 84.
Bronze medals, cast (these wear a long time)	.. ..	Copper 92, tin 8.
Jewellery—French standard	.. ..	Gold 750, copper 250.
Silver plate ditto	.. ..	Silver 950, copper 50.
Gold coin—United States standard	.. ..	Gold 899'22, copper and silver 100'78.
Silver coin ditto	.. ..	Silver 892'43, copper 107'57.
Gold coin—English standard	.. ..	Gold 916'67, silver and copper 83'33.
Silver coin ditto	.. ..	Silver 925, copper 75.
Imitation gold	.. ..	Copper 91, tin 9'50. [lead 0'82.
Imitation silver (Chinese Packford)	.. ..	Copper 61'27, zinc 28'78, nickel 15'13,
For cannon	.. ..	Copper 100, tin 11. [1'37
Statues (Keller's)	.. ..	Copper 91'40, zinc 5'53, tin 1'70, lead
Bronzes and candelabras	.. ..	Copper 82'00, zinc 18'00, tin 3'00, lead
Mounting of firearms	.. ..	Copper 80, zinc 17, tin 3. [1'50.
Cymbals, Chinese gongs, &c.	.. ..	Copper 80, tin 20.

This alloy is very hard, it is annealed by dipping, while red-hot, into water, and is then malleable; whilst, if suffered to cool gradually, it is excessively hard.

Bells	.. ..	Copper 75, tin 25.
Reflectors of telescopes	.. ..	Copper 2, tin 1.
Brass for lathes	.. ..	Copper 65'80, zinc 31'80, lead 2'15.
Brass for the hammer	.. ..	Copper 70'10, zinc 29'90.

This is a most important alloy, first made by M. Chaudet.

Types	.. ..	Lead 80, antimony 20.
Alloy fusible in boiling water	.. ..	Bismuth 8, lead 5, tin 3.
Plugging teeth	.. ..	Bismuth 8, lead 5, tin 3, mercury 16.
For tinning iron	.. ..	Tin 8, iron 1.
To make ductile gold of 18 carats, 90'0 fine	.. ..	Gold 990, copper 10.
Bells of mantel clocks	.. ..	Copper 75, tin 25.
Pivots of artificial teeth	.. ..	Platinum —, silver —, (P.N.Johnson).
Ditto* ditto	.. ..	Palladium 50, silver 50.
Springs of† ditto	.. ..	Palladium 50, silver 50, copper 50, tin 10 (P. N. Johnson).

## SOLDERS.

For gold of 750, or 18 carats	.. ..	Gold of 750 2'00, copper 0'50, silver 0'50
Silver of 750	.. ..	Silver 2, brass 1.
Brass	.. ..	Copper 50, zinc 50.
Lead	.. ..	Lead 2, tin 1.

## AMALGAMS.

Gold for gilding on metal	.. ..	Mercury 91 to 89, gold 9 to 11.
Silver for ditto	.. ..	Mercury 85, silver 15.
For taking impressions of seals	.. ..	Copper —, mercury —.

This amalgam is hard, and melts at a low heat; it was used by Fouché for the purpose of opening and resealing letters. The proportions are, of course, not given.

Silvering mirrors	.. ..	Tin 70, mercury 30.
Silvering globes of glass	.. ..	Mercury 80, bismuth 20.
For cushions of electrical machines	.. ..	Mercury 2, tin 1, zinc 1.

\* A very important and useful alloy, employed in the manufacture of philosophical instruments, as a substitute for platinum, to which it is superior in hardness and colour, and yet not oxydizable under ordinary circumstances.

† Another very useful alloy, possessing a degree of elasticity inferior only to steel, combined with the advantages of superior hardness and lightness over platinum.

## RECIPES.

## COLOURS.

*Ultramarine.*—The mode of preparing this beautiful pigment is to make the stones called lapis lazuli red hot, and throw them into water, when they may be easily pulverized. It is then reduced to a fine powder in a mortar, and intimately combined with a varnish composed of resin, wax, and linseed-oil. It is then of the consistence of paste, and is put into a linen cloth, and repeatedly kneaded, with hot water. The first water is thrown away, the second gives a blue tint of the first quality, and the third yields one of less value. This process is founded on the property of the earthy matter of the stones adhering more firmly to the stone than the colouring matter; the latter is therefore separated by washing away.

*Egyptian Azure.*—Sir Humphrey Davy discovered that this beautiful pigment, which has preserved its brilliancy of tint for more than 1,700 years, may be easily and cheaply made:—Fifteen parts of the carbonate of soda, with twenty of powdered opaque flints, and three of copper filings, when strongly heated together for two hours, will produce a substance, which, when powdered, will be of a fine deep sky-blue, and closely resembling the Egyptian azure in tint.

*Artificial Ultramarine—Azure Blue—Vienna or Meissner Ultramarine.*—Mix together 1 part of porcelain clay,  $1\frac{1}{2}$  part of sulphur, 1 part of anhydrous carbonate of soda, and keep the mixture at a dull red heat, in a covered crucible, as long as vapours are given off. On opening the crucible, it will be found to contain a spongy mass, part of which will be of a dark blue colour, and this is to be separated from the other part. The results of this process are not uniform, yet this is considered the best process that has yet been published.

*Ultramarine Ashes—Sander's Blue.*—The residue left after the extraction of ultramarine, according to the preceding process; the resinous cement being burned away, and the ashes washed.

*Stone Blue—Fig Blue—Thumc Blue—Crown Blue—Mecklenburgh Blue—Queen's Blue.*—Mix finely-powdered indigo with starch paste, and make it into cakes of the required size and form.

*Mountain Blue—Hambro' Blue—Copper Blue.*—This is a mixture of carbonate of copper and chalk or lime, which is exposed to the air until it assumes the required colour.

*Blue Verditer—Refiners' Verditer.*—No. 1. The solution of nitrate of copper, obtained by the refiners in precipitating silver from nitric acid by heating it with copper, is poured, while hot, upon whiting moistened with water, and the mixture stirred until the whole of the copper is precipitated, when more of the nitric solution is added, until the desired colour is produced. No. 2. The solution of nitrate of copper, as above, is precipitated with lime, which is added in the state of slaked lime. This precipitate, when nearly dry, is triturated with more lime, to develop the velvety blue colour, characteristic of verditer of the best quality. Process frequently unsuccessful in unskilful hands.

*Prussian Blue—Berlin Blue.*—This pigment is made by calcining animal matter, such as dried blood, parings of horns, &c. with about one-eighth of its weight of carbonate of potash, in an iron retort, exposed to a dull red heat for seven or eight hours; lixivating the product of this operation, and

adding common green vitriol, or sulphate of iron, to the lixivium. The precipitate is sometimes treated with nitric acid, which increases the depth and brilliancy of the colour. This, in its pure state, is said to constitute Paris blue. Mixed with other substances, such as alumina, gypsum, sulphate of barytes, clay, or starch, it forms the inferior kinds of Prussian and Berlin blue, also Saxon blue, Erlangen blue, Mineral blue, &c.

*Saxon Blue.*—Dissolve 1 oz. of sulphate of iron and 8 oz. of alum in 1 gal. of water; then add simultaneously solutions of prussiate of potash and of common pearlash, as long as any precipitate is formed. Collect and wash the precipitate.

*Vienna Green—Sweinfurth Green.*—Dissolve 1 lb. of arsenious acid in water; mix 1 lb. of powdered verdigris with warm water, and add the former solution to it; let the mixture stand until the re-action is complete. Sometimes the ingredients are boiled together, when the process is expedited. The addition of more arsenic gives the production a yellowish tint. It may also be made by dissolving 1 lb. of arsenious acid in water, and 1 lb. of verdigris in vinegar, mixing the two solutions, and evaporating the liquor until it crystallizes.

*Brunswick Green—Mountain Green.*—The pigments sold under these names vary very much in colour and in composition. They consist of native carbonates of copper, mixed with calcarious or other heavy powders; or of artificial compounds, containing arseniate or other salt of copper; gypsum and sulphate of barytes are frequently used in these mixtures. Some of the common greens, sold under the above and other names, are merely mixtures of Prussian blue, or indigo and chrome yellow, with chalk and sulphate of barytes.

*Red Colours—Carmine—A Pigment made from Cochineal*—as follows: No. 1. Boil 1 lb. of cochineal and 1 oz. of bitartrate of potash in 4 galls. of pure distilled water, for fifteen minutes; strain the decoction through flannel, add 1 oz. of alum and  $\frac{1}{2}$  oz. of carbonate of potash, and again boil for five minutes; remove the liquid from the fire, and let it stand in a glass or earthen vessel for two or three days, that the carmine may subside.—No. 2. Boil 1 lb. 4 oz. of cochineal, and 115 grains of carbonate of soda, in 4 galls. of soft water, for 20 minutes; then remove the boiler from the fire, and add 6 drams of alum, and 1 dram of bitartrate of potash; stir the mixture for a few minutes—let it stand for a quarter of an hour, for the dregs to subside, then carefully decant off the clear liquor—strain it through a fine silk sieve, and add the whites of two eggs, well beaten up. Sometimes the carmine will immediately separate, but at other times it is necessary to put the liquor again over the fire, and heat it, but not to the boiling point.—No. 3. Boil 1 lb. of cochineal and  $2\frac{1}{2}$  drams of carbonate of potash in 5 pails of water for a quarter of an hour; remove the decoction from the fire, and stir in 1 oz. of alum—allow the solution to stand for a quarter of an hour, that the dregs may subside, then decant the clear liquor, and put it again over the fire, at the same time add  $3\frac{1}{2}$  drams of isinglass, dissolved in 1 gall. of water, and strained. At the moment of ebullition, the carmine will rise to the surface; the pan is now to be removed from the fire, and left at rest, that the carmine may subside. It should be dried in a stove, at a temperature from  $82^{\circ}$  to  $86^{\circ}$  Fahr. A wood or charcoal fire should be used in the process, as the effluvia from coal fires is said to be very injurious to the product.

*Carmine Lake.*—No. 1. To the coloured liquor remaining after the preparation of carmine, some recently precipitated and still moist alumina is added, and the mixture stirred and heated a little, until the colouring matter is carried down with the alumina.—No. 2. Add a solution of alum to the coloured liquor remaining after the preparation of carmine, and then a solution



of carbonate of potash as long as any precipitate is formed. Solution of tin is sometimes added to brighten the colour.

*Lac Lake.*—Boil fresh stick-lac in a solution of carbonate of soda, and then add a solution of alum as long as any precipitate is formed.

*Brown Red—Indian Red—Colcothar.*—Under these names are sold the peroxide of iron, obtained by calcining the salts of iron. The colour varies according to the circumstances under which the calcination is conducted. The true Indian Red (*Terra persica*) is a mineral brought from Ormuz.

*Ruddle—Reddle—Red Chalk—Red Lumber Stone.*—These names are applied to clay iron-ore, consisting of clay and oxide of iron, a mineral of a deep red colour, intermediate between Bole and Red Ochre, containing more oxide of iron than the former, and less than the latter. It is used for marking on wood, paper, &c., and is made into crayons. It is also sometimes used in paints.

*Venetian Red—Bolus Veneta.*—A kind of Red Ochre, brought from Venice. It is also harder and darker coloured by heating.

*White Colours—Alum White (Baum's Alum White).*—Mix  $\frac{1}{2}$  lb. of honey with 1 lb. of alum; calcine the mixture in a shallow vessel, and heat it to whiteness—wash dry, and powder the residue, which will be beautifully white, and suitable for use with oil.

*White Lead (Basic Carbonate of Lead).*—Made by exposing sheet-lead to the vapour of acetic acid in close chambers. Different varieties of this pigment have been distinguished, according to the process by which they have been made. Thus, common vinegar, alegar, molasses vinegar, the refuse water of starch-makers, &c. have been used in the process, and the products distinguished as Flake White, Nottingham White, Grace's White Lead, &c.

*Venice White.*—Carbonate of lead, sulphate of baryta, *p. æ.*

*Hamburgh White.*—Carbonate of lead, 1 part; sulphate of baryta, 2 parts.

*Krem's White.*—Pure carbonate of lead.

*Naples Yellow.*—3 parts of white oxide of antimony, 12 of white oxide of lead, 1 of sulphate of alumina, and 1 of muriate of ammonia, first heated weakly for some hours, and then kept in a red heat.

*Cake Oil Colours.*—The colours are first ground with a weak solution of mastic in oil of turpentine; they are then dried, put on a stone heated by a charcoal fire put under it, and ground with a mixture of 3 parts of spermaceti and 1 part of poppy-oil. The paste is afterwards pressed into a mould, and allowed to harden.

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#### PYROTECHNICS.

*Coloured Fires—Blue Fires.*—5 parts nitre, 2 parts sulphur, 1 part metallic antimony. Mix.

*Crimson Fire.*— $4\frac{1}{4}$  parts chlorate of potash,  $67\frac{1}{2}$  parts nitrate of strontia,  $5\frac{3}{4}$  parts charcoal,  $22\frac{1}{2}$  parts sulphur. Mix.

*Green Fire.*— $62\frac{1}{2}$  parts nitrate of baryta,  $10\frac{1}{2}$  parts sulphur,  $23\frac{3}{4}$  parts chlorate of potash,  $1\frac{3}{4}$  part charcoal,  $1\frac{3}{4}$  part sulphuret of arsenic. Mix.

*Lilac Fire.*—49 parts chlorate of potash, 25 parts sulphur, 20 parts dry chalk, 6 parts black oxide of copper. Mix.

*Purple Fire.*—42 parts chlorate of potash, 42 parts nitre,  $22\frac{3}{4}$  parts sulphur, 10 parts black oxide of copper,  $2\frac{3}{4}$  parts sulphuret of mercury. Mix.

*White Fire.*— $46\frac{1}{2}$  parts nitre, 23 parts sulphur,  $12\frac{1}{4}$  parts gunpowder, 18 parts zinc powder. Mix.



*Yellow Fire.*— $7\frac{1}{4}$  parts dried nitrate of soda,  $19\frac{1}{2}$  parts sulphur, 6 parts charcoal. Mix.

Some of these compositions are liable to undergo spontaneous combustion when kept for some time, even when enclosed in bottles. Serious accidents have arisen from this cause.

*Red Fires.*—72 parts dried nitrate of strontia, 20 parts sulphur, 6 parts gunpowder, 2 parts coal-dust.

*Congreve or Lucifer Matches.*—No. 1. Gum arabic, 16 parts; phosphorus, powdered, 9 parts; nitrate of potash, 14 parts; black oxide of manganese, 18 parts; made into a paste with water, and the matches dipped into it. No. 2. Phosphorus, 4 parts; nitrate of potash, 10 parts; glue, 6 parts; red lead, 5 parts; smalt, 2 parts. The glue is first soaked in cold water, then put into a heated mortar, so as to liquefy it; the phosphorus is then added, then the nitre, red lead, and smalt: and the whole mixed into an homogeneous mass, the temperature being never allowed to exceed  $167^{\circ}$  Fahr. The matches are dipped into this paste, and then dried. These matches ignite on being rubbed over a rough surface. The phosphorus may be reduced to a state of minute division suitable for use in these preparations, by putting it into a flask or bottle with some spirit; immersing the bottle in hot water until the phosphorus is melted, then briskly agitating it until cold.

*Matches for obtaining Instantaneous Light, by Chemical Action—Chlorate Matches.*—No. 1. Chlorate of potash, 2 scruples; white sugar, 12 grains; sulphur, 8 grains; powdered tragacanth, 4 grains; vermilion, 6 grains. Reduce the ingredients separately to powder, mix them together, form them into a paste with water, dip the ends of the matches into the paste, and dry them.—No. 2. Chlorate of potash, 1 drachm; sulphur, 6 grains; white sugar, 6 grains; powdered gum arabic, 5 grains; golden sulphuret of antimony, 5 grains. Mix into a paste with water, and apply as No. 1. These matches ignite on being dipped into a bottle containing asbestos, wetted with a strong oil of vitriol.

## CEMENTS.

*Various Cements.*—No. 1. Shellac dissolved in rectified spirit forms a good cement in some cases; or the shellac may be melted in the flame of a candle, and applied in this state. Shellac dissolved in water, with one-third of its weight of borax, is sometimes used.—No. 2. The white of egg mixed with fine prepared quicklime, forms a good cement for joining spars and marble ornaments. A similar composition is used by coppersmiths to secure the joints and rivets of boilers, but they substitute bullocks' blood for the white of egg.—No. 3. Clean river sand, 20 lbs.; litharge, 2 lbs.; quicklime 1 lb.; linseed-oil sufficient to form a thin paste. This cement is applied to mend broken pieces of stone, as steps, &c.; and after a time it becomes exceedingly hard and strong. A similar composition has been used to coat brick walls, under the name of mastic.—No. 4. Iron-borings, 50 lbs., pounded and sifted; mix with 1 lb. of chloride of ammonium, or sal-ammoniac. When it is to be used, it should be mixed with as much water as will give it a pasty consistence. This is an excellent cement for stopping cracks in iron boilers, tanks, &c.—No. 5. Iron-borings, 4 lbs.; potters' clay, 2 lbs.; powdered potsherds, 1 lb. Make into a paste with salt and water. This becomes very hard on drying.—No. 6. Chalk, 1 lb.; glue, 2 lbs.; paper, 1 lb. boiled in water, and beaten to a pulp. Mix. Used for making architectural ornaments in relief.—No. 7. Whiting, 16 lbs. sifted and heated to redness; black resin, 16 lbs.; bees' wax, 1 lb. The last two are to be

melted together, and the whiting to be stirred in during the cooling.—No. 8. Boiled linseed-oil and red lead, mixed so as to form a thin paste. Used by engineers.

*Engineers' Cement.*—No. 1. Mix ground white lead with as much finely-powdered red lead as will make it the consistence of soft putty.—No. 2. Mix equal parts with white lead and red lead, and add as much boiled linseed-oil as is required to give it the proper consistence. These cements are used for making metallic joints sound.

*French Cement.*—Gum water thickened with powdered starch. It is used by the French naturalists and artificial flower-makers. It keeps for a long time. A little lemon-juice is sometimes added.

*Marine Cement—Marine Glue.*—Digest from 2 to 4 parts of caoutchouc, cut into small pieces, in 34 parts of coal-tar naphtha, promoting solution by the application of heat and by agitation. The solution, when formed, will have the consistency of thick cream; to this add 62 or 64 parts of powdered shellac, and heat the mixture over the fire, constantly stirring it until complete fusion and combination has been effected. Pour the mixture, while still hot, on plates of metal, so that it may cool in thin sheets like leather. In using this cement, put some of it in an iron vessel, and heat it about 248° Fahr., and apply it with a brush to the surfaces to be joined. It is said to make a perfect union of pieces of wood, and is recommended for use in shipbuilding—hence its name.

*Keene's Marble Cement.*—Gypsum is baked in the same way as for making plaster of Paris; it is then soaked in a saturated solution of alum—again baked to the same degree as before, and ground to a fine powder. It is now in a fit state for use. On being worked in the same way as plaster of Paris, it sets into a very hard composition, which is capable of taking a high polish. It may be coloured by mixing the powder with water containing any mineral colours, instead of common water.

*For Mending Steam-Boilers, &c.*—Mix two parts of finely-powdered litharge with one part of very fine sand, and one part of quicklime, which has been allowed to slack spontaneously by exposure to the air. This mixture may be kept for any length of time without injury. In using it, a portion is mixed into a paste with linseed-oil, or, still better, boiled linseed-oil. In this state it must be quickly applied, as it soon becomes hard.

*Hamelin's Mastic Cement.*—Mix 50 parts of silicious sand, 50 parts of lime marl, or pulverized Portland or Bath stone, and 8 parts of litharge. When the cement is used, it is to be ground up with linseed-oil.

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#### LACQUERS AND VARNISHES.

*Lacquers.*—No. 1.—Shellac, 120 parts; sandrach, 45 parts; mastic, 30 parts; black resin, 90 parts; dragons' blood, 30 parts; turmeric and gamboges, each 24 parts; rectified spirit 1,000 parts. Digest until dissolved, then strain.—No. 2. Seedlac, 120 parts; sandrach, 120 parts, dragons' blood, 16 parts; gamboge, 2 parts; turmeric, 2 parts; Venice turpentine, 50 parts; clean sand, 150 parts; rectified spirit, 1,000 parts. Digest in a sand bath, and strain.—No. 3. Seedlac, gamboge, and dragons' blood, each 120 parts; saffron, 30 parts; rectified spirits, 1,000 parts. Digest with heat and strain. No. 4. Seedlac and sandrach, each 120 parts; dragons' blood, 15 parts; turmeric, 2 parts; gamboge, 2 parts; Venice turpentine, 60 parts; spirit of turpentine, 1,000 parts. Digest with heat and strain. Aloes are sometimes used to give it a darker colour.

*Copal Varnish.*—No. 1. Copal, 10 parts, in coarse powder; clean sand, 10 parts; camphor, 1 part; rectified spirit, 100 parts. Mix the copal and sand, and enclose them in a linen bag. Dissolve the camphor in the spirit, and put them into a cohobation apparatus, suspending the bag of resin near the top of the liquid. Boil the spirit until the resin is dissolved.—No. 2. Copal, 90 parts; sandrach, 180 parts; mastic, 90 parts; Venice turpentine, 75 parts; clean sand, 100 parts; rectified spirits, 1,000 parts. Dissolve as No. 1. Anime is generally substituted for copal in making these varnishes.

*Picture Varnish.*—No. 1. Mastic Varnish. Mastic, 300 parts; Venice turpentine, 45 parts; camphor, 15 parts; spirit of turpentine, 1,000 parts. Dissolve with heat.—No. 2. Copal, or anime, 60 parts; camphor, 4 parts; oil of spike lavender, 180 parts. Dissolve with heat, then add spirit of turpentine, sufficient to give it the proper consistence.

*Lac Varnish.*—Shellac, 90 parts; Venice turpentine, 4 parts; rectified spirit, 500 parts. Digest until dissolved, then strain.

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#### SEALING-WAX.

*Sealing-Wax.*—The basis of the best sealing-wax is shellac and dammar, or anime resins, but inferior sorts are made with common resin. The light-coloured resins, which will burn well, and flow in a semi-fluid state, are selected for receiving the light and delicate colours which are imparted by the admixture of certain pigments.—No. 1. *Red Sealing-Wax*—Shellac, 2 lbs.; Venice turpentine, 1 lb.; vermilion, or best bichromate of lead,  $1\frac{1}{2}$  lb. Melt the shellac and turpentine together with heat, and add the pigment as the mixture cools.—No. 2. Shellac, 2 lbs.; dammar or anime resin, 4 lbs.; Venice turpentine, 1 lb.; vermilion, or best bichromate of lead, 2 lbs. Mix as No. 1.—No. 3. Shellac, 2 lbs.; common yellow resin, 4 lbs.; Venice turpentine,  $1\frac{1}{2}$  lb.; bichromate of lead, 2 lbs. Mix.

*Black Sealing-Wax* is made in the same way as the red, only substituting lamp-black for vermilion. In like manner other colours are imparted, by varying the pigment, and using chromate of lead, verdigris, green verdita, &c.

*Gold Sealing-Wax* is made by using gold-coloured talc, or bisulphuret of tin.

*Marbled Sealing-Wax.*—Melt in separate vessels a portion of wax of each colour intended to be mixed, and when they are partly cooled, mix them together, slightly stirring the mixture with a rod.

*Soft Sealing-Wax.*—Bees' wax, 4 lbs.; Venice turpentine, 1 lb.; levigated bole, sufficient to give the required colour.

*Bottle Wax.*—Black resin, 6 lbs.; bees' wax,  $\frac{1}{2}$  lb.; ivory, or lamp-black,  $1\frac{1}{2}$  lb. Mix with heat. Venetian red, red lead, or bole, may be substituted for lamp-black.

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#### BLACKING.

*English Patent Process for the Manufacture of Blacking—Paste Blacking.*—Ivory black, 60 lbs.; treacle, 45 lbs.; vinegar, 12 lbs.; oil of vitriol, 12 lbs. Mix for 30 minutes, and add 9 lbs. of India-rubber oil.

*Liquid Blacking.*—Ivory-black, 60 lbs.; gum arabic, 1 lb.; dissolved in vinegar, No. 24 (20 gallons). Mix well, and add gradually oil of vitriol, 24 lbs. Stir half an hour daily for a month. After 10 days add—gum arabic, 3 lbs.; India-rubber oil; India rubber, in small pieces, 18 oz.; rape-oil, 9 lbs. Dissolve in a water bath.



*French Patent Blacking.*—Treacle, 2,000 parts; add gelatine or glue, 60 parts. Mix this with animal charcoal, 5,000; add oleic acid, or other oil, 90 parts; any salt of copper, 15 parts; ox gall, 5 parts; lastly, oil of vitriol, 1,000 parts; muriatic acid, 1,000 parts. Mix the whole well together.

*Common Blacking.*—No. 1. Ivory-black and treacle, each 12 oz.; sperm-oil, and oil of vitriol, of each 3 oz.; vinegar, 4 pints. Mix the ivory-black, treacle, and vinegar together; then mix the sperm-oil and oil of vitriol, separately, and add them to the other mixture.—No. 2. Ivory-black, 12 oz.; treacle, 4 oz.; sperm-oil, 1 oz.; oil of vitriol, 2 oz.; vinegar, 2 pints; sugar-candy, 1 oz. Mix as No. 1.—No. 3. Lamp-black and brown sugar, of each 16 oz.; sperm-oil, 3 oz.; gum arabic,  $\frac{1}{2}$  oz.; oil of vitriol, 3 oz.; vinegar, 4 pints; water, 2 pints. Dissolve the sugar and gum in the water, add to this the lamp-black and oil; and then the vinegar and oil, previously mixed together.—[It is a point of much importance in the manufacture of blacking, that the ivory-black be genuine; the ivory-black ordinarily sold usually containing a large proportion of powdered wood charcoal. The surest method is to purchase the animal charcoal in a granular state, such as is used by the sugar-refiner and the chemist for decolorizing purposes, and reduce it to powder.]

#### MISCELLANEOUS.

*To give the Appearance of Marble to Plaster Figures.*—To 1 oz. of Windsor soap (grated), dissolved in a glazed earthenware vessel in 4 fluid pounds of water, add 1 oz. of bees' wax, cut into thin slices, and when incorporated it will be fit for use. Dry the figure well before a fire, dip into the varnish (which it will at first appear to absorb), and in about two minutes stir the compost and dip it again. Put it out of dust for a week, then rub it gently with a soft linen rag or cotton wool, and a fine gloss will be produced. Great care, however, is necessary to be taken in this part of the process.

*Tanned Gelatine, or Artificial Horn.*—A manufactory has been established in Paris for the construction of a variety of ornamental articles with this substance. The gelatine is usually obtained from bones by treating them with a weak solution of muriatic acid, and it is afterwards tanned by the common process, as in making leather. Upon becoming hard and dry, it assumes the appearance of horn or tortoise-shell, and is employed for the same purposes as those natural productions. It is softened by being boiled in water with potash, when it may be formed into any shape, and the figure preserved by drying the articles between moulds. In the soft state it may also be inlaid with gold, silver, or other metals, and it may be streaked with various coloured materials, so as to resemble the finest and most beautiful woods. It is probable that this substance will soon be brought very extensively into use, on account of its elegance and cheapness.

*Artificial Mahogany.*—The following method of giving any species of wood of a close grain the appearance of mahogany in texture, density, and polish, is said to be practised in France with such success, that the best judges are incapable of distinguishing between the imitation and mahogany. The surface is first planed smooth, and the wood is then rubbed with a solution of nitrous acid; 1 oz. of dragons' blood is dissolved in nearly a pint of spirits of wine; this and one-third of an ounce of carbonate of soda are then to be mixed together and filtered, and the liquid in this thin state is to be laid on with a soft brush. This process is to be repeated, and in a short interval afterwards the wood possesses the external appearance of mahogany. When the polish diminishes in brilliancy, it may be restored by the use of a little cold-drawn linseed-oil.



## PART II.

### Scientific Bodies.

#### SOCIETIES FOR THE PROMOTION OF ENGINEERING, MINING, AND ALLIED SCIENCES.

<i>Birmingham</i> ..	Institution of Mechanical Engineers Polytechnic Institution	<i>London</i> ....	Geological Society Society of Arts Chemical Society United Service Institution
<i>Dublin</i> ....	Royal Dublin Society Institution of Civil Engineers	<i>Manchester</i> ..	Philosophical Society
<i>Dudley</i> ....	Dudley and Midland Geological Society	<i>Newcastle</i> ..	Literary and Philosophical Society
<i>Edinburgh</i> ..	Scottish Society of Arts Wernerian Society	<i>Paris</i> .....	Institution of Civil Engineers
<i>Leeds</i> .....	Geological and Polytechnic Institution of the West Riding	<i>Philadelphia</i> ..	Franklin Institute
<i>Liverpool</i> ..	Polytechnic Institution	<i>Penzance</i> ..	Royal Cornwall Geological Society
<i>London</i> ....	Institution of Civil Engineers Linnean Society	<i>Falmouth</i> ..	Polytechnic Society
		<i>Worcester</i> ..	Natural History Society
		<i>York</i> .....	Yorkshire Philosophical Society

British Association for the Advancement of Science.

#### MUSEUMS OF ENGINEERING, MINING, AND ALLIED SCIENCES.

<i>Bristol</i> ..	Bristol Institution	<i>London</i> ..	Institution of Civil Engineers Royal Polytechnic Institution United Service Museum Mr. Saul's Museum of Geology, Aldersgate-street Society of Arts
<i>Dublin</i> ..	Royal Dublin Society	<i>Worcester</i> ..	Museum
<i>Dudley</i> ..	Dudley and Midland Geological Society	<i>York</i> ....	Yorkshire Philosophical Society
<i>Durham</i> ..	College Museum		
<i>London</i> ..	British Museum Geological Society Museum of Economic Geology East-India Museum		

## LIBRARIES OF ENGINEERING, MINING, AND ALLIED SCIENCES.

<i>Birmingham</i> Polytechnic Institution	<i>London</i> .... Geological Society
<i>Dublin</i> .... Trinity College	Records of Registrar of
Royal Dublin Society	Joint Stock Companies
<i>Edinburgh</i> .. Advocates' Library	United Service Institution
<i>Glasgow</i> .... University Library	Institution of Civil Enginrs
<i>London</i> .... British Museum	Putney College
Linnean Society	London Mechanics' Insti-
Museum of Econ. Geology	tution
Records of Regis. of Designs	<i>Truro</i> ..... Royal Cornwall Institution

## SCHOOLS OF ENGINEERING, MINING, AND ALLIED SCIENCES.

<i>Addiscombe</i> .. Royal East-India College	
<i>Belfast</i> ..... Queen's College	
<i>Birmingham</i> .. Queen's College	
<i>Bombay</i> ..... Elphinstone College	
<i>Chatham</i> .... Military Academy (Engineering)	
<i>Cirencester</i> .. Royal Agricultural College (Geology, Chemistry, and Surveying)	
<i>Cork</i> ..... Queen's College	
<i>Dublin</i> ..... Trinity College (Engineering, Geology, and Chemistry)	
Royal Dublin Society (Geology and Chemistry)	
<i>Durham</i> ..... University College (Engineering, Geology, and Chemistry)	
<i>Glasgow</i> ..... University College (Engineering and Chemistry)	
<i>London</i> ..... University College (Engineering, Geology, and Chemistry)	
King's College (Engineering, Geology, and Chemistry)	
Royal Institution (Chemistry)	
Museum of Economic Geology (Mineralogy)	
Royal Academy, Woolwich	
Royal Polytechnic Institution (Chemistry and Steam Engines)	
College for Chemistry (Chemistry)	
Putney College (Engineering, Geology, and Chemistry)	
<i>Portsmouth</i> .. Naval College	
<i>Sandhurst</i> .... Royal Military College	
<i>St. Andrew's</i> .. St. Salvador College (Engineering and Chemistry)	

## EXHIBITIONS OF ENGINEERING AND ALLIED SUBJECTS.

British Association (Mechanical Section)	National Exhibition, 1851—Office, Old
Royal Agricultural Association (Ma-	Scotland-yard
chinery)	Society of Arts, John-street, Adelphi

## CHEMICAL LABORATORIES.

<i>Belfast</i> .. Royal Academical Institution	<i>London</i> .. Putney College
<i>Birmingham</i> Queen's College	St. Bartholomew's College
<i>Bristol</i> .. Medical School	St. Thomas's College
<i>Dublin</i> .. Trinity College	St. George's College
Royal Dublin Society	Hunterian School
Apothecaries' Hall	Guy's,
<i>Durham</i> .. University College	London,
<i>Edinburgh</i> University	Middlesex,
<i>Glasgow</i> .. University	Charing Cross, and
Andersonian University	Westminster Hospitals
<i>Liverpool</i> Medical School	Royal Mil. Acad., Woolwich
<i>London</i> .. University College, Birkbeck	Royal Institution
Laboratory	London Institution
King's College	Apothecaries' Hall
Museum of Economic Geology	<i>Manchestr</i> Medical School
Royal Polytechnic Institution	<i>Newcastle</i> Medical School
College for Chemistry	

## ASSAY OFFICES.

<i>Birmingham</i> Assay Office	<i>London</i> .. Goldsmiths' Hall
<i>Chester</i> .. Goldsmiths' Hall	Royal Mint
<i>Dublin</i> .. Goldsmiths' Hall	Apothecaries' Hall
Apothecaries' Hall	Royal Polytechnic Institution
<i>Edinburgh</i> Goldsmiths' Hall	<i>Newcastle</i> Goldsmiths' Hall
<i>Exeter</i> .. Goldsmiths' Hall	

## THE ROYAL SOCIETY.

### HER SACRED MAJESTY QUEEN VICTORIA, PATRON.

#### *Date of Election.*

- 1840 Apr. 30—His Royal Highness Prince Albert of Saxe Coburg and Gotha  
 1828 Apr. 24—His Royal Highness Ernest Augustus, Duke of Cumberland, King of Hanover  
 1817 May 22—His Imperial Majesty Nicholas, Emperor of all the Russias  
 1842 Jan. 20—His Majesty Frederick William IV., King of Prussia  
 1816 — His Majesty Leopold, King of the Belgians  
 1822 June 6—His Majesty Christian VIII., King of Denmark, D.C.L.  
 1844 June 13—His Majesty Frederick, King of Saxony  
 1826 Dec. 21—His Majesty Oscar I., King of Sweden and Norway  
 1838 May 24—His Imperial and Royal Highness Leopold the Second, Grand Duke of Tuscany  
 1816 Feb. 8—His Imperial Highness the Archduke John of Austria  
 1816 Feb. 8—His Imperial Highness the Archduke Louis of Austria  
 1802 Mar. 4—His Imperial Highness the Archduke Maximilian of Austria

### The Council.

#### The Earl of Rosse, *President.*

- |  |  |
|--|--|
| G. Rennie, Esq., <i>Treasurer</i>                | Leonard Horner, Esq.                   |
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| Thomas Bell, Esq., <i>Secretary</i>              | William Allen Miller, M.D.             |
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| Sir Benjamin Collins Brodie, Bart.               | Right Hon. Sir Frederick Pollock, M.A. |
| Charles Darwin, Esq., M.A.                       | Lieut.-Col. William Reid, R.E.         |
| John Forbes, M.D.                                | Peter Mark Roget, M.D.                 |
| William Robert Grove, Esq., M.A.                 | Charles Wheatstone, Esq.               |

Charles Richard Weld, *Assistant Secretary.*

### Fellows of the Society.

#### *Date of Election.*

- 1808 Aberdeen, G., Earl of, K.T. Trust. Brit. Mus.—President of the Society of Antiquaries, F.L.S. Argyll-house  
 1847 Ackland, H. W. D., M.D. Oxford  
 1839 Acland, Sir T. Dyke, Bart., F.G.S. Killerton-park, Devon  
 1845 Adair, R. S. 7, Audley-square  
 1834 Adare, E., Viscount, F.R.A.S. Adare-abbey, Limerick; Dunraven-castle, Glamorganshire  
 1846 Addison, W., M.D., F.L.S. Great Malvern  
 1832 Agar, Hon. G. C., M.A. University Club  
 1836 Airy, G. B., M.A., D.C.L., Astronomer Royal, V.P.R.A.S.—Hon. Mem. R.S.E., R.I.A., R.I.S.W., F.C.P.S. The Royal Observatory, Greenwich  
 1841 Alderson, J., M.D., Coll. Reg. Med. Socius. 36, Charles-street, Berkeley-sq.  
 1847 Alexander, H. 6, Cork-street  
 1844 Allen, W., Capt., R.N. Athenæum Club  
 1824 Amyot, T., Treas. S.A., Hon. M.R.I.A. Soc. Reg. Antiq. Septen. Hafn. Socius. 13, James-street, Westminster  
 1821 Andrew, J., LL.D.  
 1834 Ansell, C., F.S.A. Tottenham  
 1844 Ansted, D. T., M.A., F.G.S., F.L.S., F.C.P.S., Professor of Geology, King's College, London. 36, Gloucester-road, Hyde-park-gardens

- 1840 Archibald, C. D., F.S.A., F.G.S., M.R.I. 3, York-terrace, Regent's-park  
 1846 Armstrong, W. G. Newcastle-upon-Tyne  
 1843 Arnott, J. M. 2, New Burlington-street  
 1838 Arnott, N., M.D. 38, Bedford-square  
 1830 Audubon, J. J., F.L.S.  
 1840 Auldjo, J. Noel-house, Kensington  
 1837 Ayrtton, W., F.S.A. 39, Dorset-square  
 1816 Babbage, C., M.A., F.R.S.E., Hon. M.R.I.A., F.R.A.S., M.C.P.S. Inst. Reg. Sc. Paris., Corresp. Acad. Reg. Sc. Masil., Hafn., et Divion. ex. intim., &c. 1, Dorset-street, Manchester-square  
 1816 Baber, Rev. H. H., M.A., M.R.S.L., &c. Streatham, Cambridgeshire  
 1828 Babington, B. G., M.D., Coll. Reg. Med. Socius. 31, George-street  
 1847 Back, Sir G., Knt., Capt., R.N. Gloucester-place, Portman-square  
 1836 Baillie, D. 14, Belgrave-square  
 1842 Baily, E. H., R.A. 10, Percy-street, Tottenham-court-road  
 1847 Baly, W., M.D., Coll. Reg. Med. Socius. 28, Spring-gardens  
 1845 Bandon, Right Hon. Earl. 6, Hyde Park-terrace  
 1834 Barlow, Rev. J., M.A., F.L.S., Sec. R.I. 5, Berkeley-street, Piccadilly  
 1823 Barlow, P., F.R.A.S., Hon. M.C.P.S., &c. Royal Mil. Academy, Woolwich  
 1845 Barlow, P. W. 8, Elliot-place, Blackheath  
 1809 Barnwell, C. F., M.A., F.S.A. 44, Woburn-place, Russell-square  
 1823 Baron, J., M.D. Cheltenham  
 1844 Barrow, J. 7, New-street, Spring-gardens  
 1840 Barry, M., M.D., F.R.S.E., Coll. Reg. Med. Edin. Socius. Edinburgh  
 1838 Bateman, J., F.L.S. Knypersley-hall, Staffordshire  
 1827 Beamish, Maj. N. L., K.H. Wyndham Club, St. James's-square  
 1836 Beamish, R.  
 1814 Beaufort, F., Capt. R.N., F.G.S., F.R.A.S., &c. Admiralty  
 1815 Beaufoy, H., F.L.S. South Lambeth  
 1835 Beaumont, E. B., F.R.A.S. 144, Piccadilly  
 1824 Beechey, F. W., Capt. R.N., F.R.A.S. 8, Westbourne-crescent  
 1835 Beetham, A. W., F.S.A. 3, Serjeants'-inn, Fleet-street  
 1828 Bell, T., F.L.S., F.G.S., Socc. Hist. Nat. et Philomath., Paris, &c. 17, New Broad-street  
 1834 Bellamy, Rev. J. W., B.D. Sellinge Vicarage, Ashford, Kent  
 1841 Bennett, J. J., Sec. L.S. British Museum  
 1831 Beverly, C. J., F.L.S. 1, Hackney-grove, Hackney  
 1822 Bexley, N., Lord, M.A., F.S.A., M.R.S.L. 31, Great George-street  
 1827 Bicheno, J. E., F.L.S., F.G.S., Col. Sec. Van Diemen's Land, Hobarton  
 1844 Billing, A., M.D., Col. Reg. Med. Socius, &c. 6, Grosvenor-gate, Park-lane  
 1846 Bird, G., A.M., M.D., Coll. Reg. Med. Socius. 19, Myddleton-square  
 1848 Bishop, G. South Villa, Regent's-park  
 1844 Bishop, J. 38, Bernard-street, Russell-square  
 1830 Blake, Capt. B., F.G.S., F.R.A.S. India  
 1843 Blake, H. W. Soho, Birmingham; and 62, Portland-place  
 1807 Blake, W., M.A., F.G.S. 62, Portland-place  
 1831 Blake, W. J. 62, Portland-place  
 1841 Blakiston, P., M.D., Coll. Reg. Med. Socius. Birmingham  
 1816 Bland, M., F.S.A., F.G.S. St. Leonard's, Hastings  
 1821 Bland, Rev. M., D.D., F.S.A., F.R.A.S., M.R.S.L. Lilley Rectory, Luton  
 1841 Blore, E. 4, Manchester-square  
 1837 Boase, H., M.D., F.G.S. Claverhouse, near Dundee  
 1840 Boileau, J. T., Major E.I.C.S. India  
 1843 Boileau, Sir J., Bart. 20, Upper Brook-street  
 1840 Bonner, Col. J. G., E.I.C.S. 11 A, Great Cumberland-street  
 1834 Booth, Sir F., Bart. 43, Portland-place; and Hendon, Middlesex  
 1846 Booth, Rev. J., LL.D., M.R.I.A. Everton, Liverpool  
 1835 Borrer, W., F.L.S. Henfield, Sussex  
 1829 Bosworth, Rev. J., LL.D., F.S.A., M.R.I.A. 9, Southampton-st., Bloomsb.  
 1839 Botfield, B., M.P., F.S.A., F.R.A.S., F.G.S., F.L.S. Norton-hall, Northamp.  
 1814 Boughton, Sir W. E. R., Bart. Downton-hall, Ludlow  
 1842 Bowerbank, J. S., F.G.S. 3, Highbury-grove  
 1841 Bowman, W. 14, Golden-square  
 1809 Brande, W. T., F.R.S.E. Royal Mint  
 1821 Brandreth, T. S. University Club  
 1834 Breadalbane, J. C., Marquis of, K.T. 21, Park-lane



- 1815 Brewster, Sir D., K.H., LL.D., F.R.S.E., Hon. M.R.I.A., F.G.S., F.R.A.S.,  
&c. St. Andrew's
- 1838 Briggs, Maj.-Gen. J., E.I.C.S., M.R.A.S., F.G.S. 3, Charles-st., St. James's
- 1821 Bright, R., M.D., Coll. Reg. Med. Socius, F.G.S., &c. 11, Saville-row
- 1810 Brisbane, Lieut.-Gen. Sir T. M., Bart., K.C.B., G.C.H., D.C.L. Makerstown
- 1805 Bristol, F. W., Marquis of. 6, St. James's-square
- 1834 Brockedon, W. 29, Devonshire-street, Queen-square
- 1828 Broderip, W. J., B.A., F.L.S., F.G.S. 2, Raymond's-buildings, Gray's-inn
- 1810 Brodie, Sir B. C., Bart. 14, Saville-row
- 1817 Bromhead, Sir E. F., Bart., M.A., F.R.S.E., F.R.A.S. Thurlby, Lincolnshire
- 1823 Brooke, Sir A. B. de Capell, Bart., M.A., F.L.S., F.G.S. Okeley
- 1847 Brooke, C., B.A. 29, Keppel-street, Russell-square
- 1819 Brooke, H. J., F.L.S., F.G.S. Clapham-rise
- 1803 Brougham, H., Lord, M.A. 4, Grafton-street
- 1842 Broughton, R. E. 1, Melcombe-place
- 1811 Brown, R., D.C.L., Hon. Mem. R.S.E., R.I.A., &c. 17, Dean-street, Soho
- 1838 Brownlow, J., Earl, D.C.L., F.S.A., F.L.S., F.G.S., M.R.A.S. 12, Belgrave-square
- 1829 Bruce, Right Hon. Sir J. L. K., Knt., F.S.A. Roehampton Priory
- 1830 Brunel, I. K. 18, Duke-street, Westminster
- 1814 Brunel, Sir M. I., Knt.
- 1833 Buccleuch, W. F., Duke of, K.T., D.C.L., F.L.S. Whitehall-gardens
- 1818 Buckland, Very Rev. W., D.D., Dean of Westminster, F.L.S., V.P.G.S., &c.  
Deanery, Westminster
- 1836 Budd, G., M.D., Col. Reg. Med. Socius. 20, Dover-street, Piccadilly
- 1846 Buist, G., D.C.L. Bombay
- 1829 Burlington, W., Earl of, M.A. 10, Belgrave-square
- 1835 Burnes, J., K.H., D.C.L. India
- 1837 Burnet, J. 12, Sloane-street
- 1838 Burnet, Rev. T., D.D. 13, Finsbury-square
- 1833 Burnett, Sir W., K.C.H., M.D., &c. 5, Somerset-place
- 1814 Burney, Rev. C. P., D.D., F.S.A., F.L.S., F.G.S., F.R.A.S., M.R.A.S.,  
M.R.S.L. Rectory-house, Sible Hedingham, Essex
- 1829 Burns, J., M.D. Glasgow
- 1818 Burrow, Rev. E. J., D.D., F.G.S. Gibraltar
- 1847 Burrows, G., M.D. 45, Queen Anne-street, Cavendish-square
- 1836 Burt, Major T. S., M.R.A.S. India
- 1832 Burton, D., F.S.A. 6, Spring-gardens
- 1836 Burton, E., F.L.S. Brooklyn, near Maidstone
- 1844 Bury, E. Hanslope-park, Newport Pagnell
- 1819 Butler, the Very Rev. G., D.D., Dean of Peterborough, F.S.A., F.R.A.S.
- 1822 Butter, J., M.D., F.L.S. Windsor-villas, Plymouth
- 1837 Cabbell, B. B., F.S.A. 1, Brick-court, Temple; and Portland-place
- 1810 Cadell, W. A., F.R.S.E., F.G.S. Edinburgh
- 1831 Caldecleugh, A., F.L.S., F.G.S. Chili
- 1840 Caldecott, J., F.R.A.S. Observatory, Travancore, India
- 1839 Carington, R. J., Lord. Whitehall-yard; and Wycombe-abbey, Bucks
- 1826 Carleton, Hon. and Rev. R., M.A. Greywell-hill, Odiham, Hampshire
- 1818 Carne, J., M.R.I.A., F.G.S. Penzance
- 1844 Carpenter, W. B., M.D. 6, Regent's-park-terrace
- 1800 Carrington, Sir C. E., Knt., D.C.L., F.S.A., M.R.A.S.
- 1841 Cartwright, S., F.L.S. 32, Old Burlington-street
- 1846 Cautley, P. T., Major, F.G.S. India
- 1812 Cawdor, J. F., Earl, Trust. Brit. Mus., F.G.S. 74, South Audley-street
- 1848 Challis, Rev. J. Cambridge
- 1828 Chambers, W. F., M.D., K.C.H., Physician to the Queen. 46, Brook-street
- 1833 Chandler, Very Rev. G., Dean of Chichester, D.C.L., M.R.S.L., R.G.S. 36,  
Mortimer-street
- 1816 Chapman, Major-Gen. Sir S. R., C.B., K.C.H. Tainfield-house, Somerset
- 1836 Chapman, J. J., Capt. R.A. Athenæum Club
- 1842 Chapman, T., F.S.A. Whitby, Yorkshire
- 1834 Chesney, Lieut.-Colonel F. R., R.A. 11, Wilton-terrace, Grosvenor-place
- 1807 Children, J. G., F.R.S., F.S.A., F.L.S. 48, Torrington-square
- 1826 Christie, S. H., M.A., V.P., R.A.S., F.C.P.S. Royal Mil. Acad., Woolwich
- 1842 Christmas, Rev. H., M.A., F.S.A. Sion College, London Wall
- 1833 Christopher, R. A. D. 97, Eaton-square

- 1818 Churchill, F. A., Lord. Cornbury-park, near Witney, Oxfordshire  
 1832 Clark, Sir J., Bart., M.D., Physician to the Queen. 22 B, Brook-street  
 1836 Clark, W., M.D. Cambridge  
 1837 Clark, W. T. Hammersmith  
 1825 Clarke, Sir C. M., Bart., M.D., LL.D. Wigginton-lodge, Tamworth  
 1820 Clarke, L. L., M.A. India  
 1841 Clendinning, J., M.D., Col. Reg. Med. Socius. 16, Wimpole-street  
 1819 Clerk, Sir G., Bart., D.C.L., M.P., F.R.S.E., F.G.S. 8, Park-street  
 1848 Clerke, Capt. H., R.A. Woolwich (abroad).  
 1833 Clerke, Major T. H. S., K.H., R.E., F.R.A.S. 4, Brompton-grove  
 1823 Clift, W., F.G.S. Stanhope-cottage, Mornington-road, Regent's-park  
 1820 Cockburn, Vice-Admiral Right Hon. Sir G., G.C.B., G.C.H., F.R.A.S.  
 1822 Codrington, Vice-Admiral Sir E., G.C.B. Admiralty-house, Portsmouth  
 1820 Colby, Maj.-Gen., R. E., LL.D., F.R.S.E., Hon. M.R.I.A., F.G.S., F.R.A.S.,  
 M.R.A.S., Ordnance Map Office, Southampton  
 1830 Collier, Charles, M.D., F.G.S. 20, Fitzroy-square  
 1830 Colquhoun, Lieut.-Colonel J. N., R.A. Athenæum Club  
 1819 Conybeare, Very Rev. W. D., Dean of Llandaff, M.A., F.G.S. Llandaff  
 1840 Cook, T., Lieut. R.N., Professor of Fortification, E. I. C. Military Academy,  
 Addiscombe  
 1829 Cooper, B.B. 2, New-street, Spring-gardens  
 1832 Cooper, C. P., LL.D., Hon. M.R.I.A. 7, New Boswell-court, Lincoln's-inn  
 1846 Cooper, S. 7, Woburn-place  
 1834 Copeland, T. 17, Cavendish-square  
 1833 Copland, J., M.D. 5, Old Burlington-street  
 1821 Cotton, W., F.S.A. 3, Crosby-square, Bishopsgate-street  
 1836 Cox, W. S. Birmingham  
 1812 Crampton, Sir P. C., D.C.L. Dublin  
 1818 Crawford, J., F.L.S., F.G.S., M.R.A.S.  
 1842 Creuze, A. F. B. 14, Grosvenor-place, New-road, Kennington  
 1800 Crichton, Sir A., Knt., M.D., F.L.S., F.G.S. Seal Chart, Sevenoaks, Kent  
 1818 Croft, Sir J., Bart., K.T.S., D.C.L. Milgate, near Maidstone  
 1810 Croker, Right Hon. J. W., LL.D.  
 1836 Crosse, J. G., M.D. Norwich  
 1843 Crozier, F. R. M., Capt. R.N.  
 1844 Crum, W. Thornlie Bank, near Glasgow  
 1830 Cubitt, W., M.R.I.A., F.R.A.S. 6, Great George-street, Westminster  
 1807 Cuming, Lieut.-General Hon. J. L.  
 1816 Cumming, Rev. J., M.A., Professor of Chemistry. Cambridge  
 1838 Cureton, Rev. W., M.A. 37, Queen Anne-street; and British Museum  
 1841 Cursetjee, A. Bombay  
 1828 Daniell, E. R. Birmingham  
 1822 Dartmouth, W., Earl of, D.C.L., F.S.A. 23, St. James's-square  
 1834 Darwin, C., M.A., Sec. G.S. Down, near Bromley, Kent  
 1822 Daubeny, C. G. B., M.D., Hon. M.R.I.A., F.L.S., F.G.S. Oxford  
 1831 Davies, G. 25, Duncan-terrace, City-road  
 1833 Davies, T. S., F.R.S.E., F.S.A. Royal Military Academy, Woolwich  
 1841 Davis, H. 17, Oxford-square, Hyde-park  
 1822 Davis, Sir J., Bart. Portland-place; and Hollywood, Compton, Bristol  
 1826 Davy, E., M.R.I.A. Dublin  
 1814 Davy, J., M.D., F.R.S.E. Ambleside, Westmorland  
 1815 Dawkins, J.C., F.S.A. Ham-common, Richmond  
 1805 De Blaquiére, Lord. Holly-house, New Kent-road  
 1819 De la Beche, Sir H. T., Knt., Vice-President, F.L.S., F.G.S., Director-General  
 of the Geological Survey of the United Kingdom. Museum of Economic  
 Geology, 6, Craig's-court, Charing-cross  
 1839 Denham, H. M., Commander R.N. 89, Pall-mall; and Athenæum  
 1841 Denham, Rev. J. F., M.A. 1, New-inn  
 1838 Denison, Sir W. T., Capt. R.E., F.R.A.S., F.R.G.S. Lieut.-Governor, Van  
 Diemen's Land  
 1833 Denman, T., Lord. 38, Portland-place; and Stoney Middleton, Derbyshire  
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 1804 Dillwyn, L. W., F.L.S., F.G.S. Sketty-hall, near Swansea  
 1832 Disney, J., F.S.A. The Hyde, near Ingatestone, Essex  
 1811 Dixon, Rev. R., M.A. Niton, Isle of Wight

- 1835 Dobson, Sir R., Knt. Royal Hospital, Greenwich  
 1819 Dollond, G., F.R.A.S. 59, St. Paul's-churchyard  
 1838 Donkin, B., F.R.A.S. 6, Paragon, Kent-road  
 1842 Donkin, W. F., M.A. Oxford  
 1830 Douglas, G. Chilston, Kent  
 1816 Douglas, Major-General Sir H., Bart., C.B., K.S.C., D.C.L., F.S.A. 15, Green-street, Grosvenor-square  
 1826 Douglas, W. R. K.  
 1836 Drory, G. W. 38, Westbourne-terrace, Hyde-park  
 1839 Drummond, H. Aldbury-park, Guildford, Surrey  
 1808 Duckett, Sir G., Bart., M.A., F.S.A., F.G.S., Hon. M.R.I.S.  
 1825 D'Urban, Major-General Sir B., K.C.B., K.C.H., K.T.S.  
 1824 Durham, E. M., D.D., Lord Bishop of, F.S.A. 4, Upper Portland-place  
 1847 Dwaris, Sir F., Knt., B.A., F.S.A. 5, James-street, St. James's-park  
 1838 Eastlake, C. L., R.A. 13, Upper Fitzroy-street  
 1835 Edye, J. 9, Mecklenburg-square  
 1841 Edye, J.  
 1831 Egerton, Sir P. de M. G., Bart., F.G.S. 30, Eaton-place  
 1815 Elliot, Sir W. F., Bart. Stobb's-castle  
 1834 Elliot, Hon. G., Rear-Admiral. 88, Eaton-place  
 1829 Elliottson, J., M.D., Coll. Reg. Med. Socius. 37, Conduit-street  
 1835 Elliott, C. 47, Portland-place  
 1832 Elliott, Rev. C. B., M.A. 47, Portland-place; and Tattingstone, Suffolk  
 1811 Ellis, Sir H., K.H., B.C.L., Sec. S.A., Hon. M.R.I.A. British Museum  
 1819 Ellis, Right Hon. H., F.G.S.  
 1847 Ellis, T. F., M.A., F.R.A.S., F.C.P.S., Attorney-General of the Duchy of Lancaster. 15, Bedford-place  
 1832 Elphinstone, Sir H., Bart., M.A., F.G.S.  
 1841 Enderby, C., F.L.S. Greenwich  
 1841 Enfield, Viscount. 77, Eaton-square  
 1829 Enniskillen, W. W., Earl of, D.C.L., F.G.S. Athenæum Club  
 1827 Everest, Lieut.-Colonel G., Bengal Artillery, F.G.S., F.R.A.S., M.R.A.S. 37, Connaught-square, Hyde park  
 1840 Ewer, W. 23, Hanover-square  
 1845 Falconer, H., M.D., F.L.S., F.G.S., Sup. of the E.I.C. Bot. Gard., Calcutta  
 1824 Faraday, M., D.C.L., Hon. Mem. R.S.E. & C.P.S., F.G.S. 21, Albemarle-st.  
 1839 Farre, A., M.D., Coll. Reg. Med. Socius. 22, Curzon-street, May-fair  
 1835 Featherstonhaugh, G. W. Havre  
 1816 Fellowes, Sir J., Knt., M.D. Pangbourne-lodge, near Reading  
 1848 Ferguson, W. King's College  
 1836 Field, J. Cheltenham-place, Lambeth  
 1842 Fielding, G. H., M.D. The Bower, Maidstone  
 1825 Fisher, Rev. G., M.A., F.R.A.S. Royal Hospital, Greenwich  
 1815 Fitton, W. H., M.D., F.L.S., F.G.S., F.R.A.S. 53, Upper Harley-street  
 1811 Fitzwilliam, C. W., Earl, F.S.A., F.G.S. Mortimer-house, Grosvenor-place  
 1839 Fletcher, T. W., F.S.A. Dudley, Worcestershire  
 1834 Ffolkes, Sir W. B., Bart. Hillington-hall, Lynn  
 1845 Forbes, E., F.L.S., F.G.S., Prof. of Bot. at King's College. King's College  
 1832 Forbes, J. D., Professor of Natural Philosophy in the University of Edinburgh, &c. Edinburgh  
 1829 Forbes, J., M.D., Coll. Reg. Med. Socius. 12, Old Burlington-street  
 1822 Forbes, W. N., F.G.S.  
 1828 Forshall, Rev. J., M.A., F.S.A., Hon. M.R.I.A., M.R.S.L. British Museum  
 1821 Forster, E., V.P.L.S. 11, Mansion-house-street; and Woodford, Essex  
 1817 Fortescue, H., Earl, K.P. 17, Grosvenor-sq.; and Castlehill, Southmolton  
 1802 Fowler, R., M.D., F.S.A. Salisbury  
 1845 Fownes, G., Professor of Practical Chemistry, University College, London  
 1848 Fox, R. W. Falmouth  
 1823 Franklin, Sir J., Knt., Capt. R.N., D.C.L., F.L.S., F.R.G.S., F.G.S., F.R.A.S., Acad. Scient. Paris., et Soc. Geogr. Paris. Corresp.  
 1821 Franks, W., M.A. Wood-hill, Hatfield, Hertfordshire  
 1837 Frere, G. E. Roydon-hall, Diss, Norfolk  
 1834 Freshfield, J. W., F.G.S. 15, Regent-street; and Leatherhead, Surrey  
 1820 Friend, M. C., Lieut. R.N. George Town, Van Diemen's Land  
 1839 Frodsham, W. J. Change-alley, Cornhill  
 1834 Galloway, T., M.A., F.R.A.S. 45, Torrington-square



- 1816 Gardiner, Rev. S. J., M.A.  
 1839 Gaskin, Rev. T., M.A., F.R.A.S. Jesus College, Cambridge  
 1840 Gassiot, J. P. Clapham-common  
 1796 Gibbes, Sir G. S., Knt., M.D., F.L.S. 2, Oriel-place, Cheltenham  
 1846 Gilbert, I. W. London and Westminster Bank, Lothbury  
 1834 Gilbert, J. D., M.A. Eastbourne, Sussex; and Trelissick, Truro, Cornwall  
 1828 Glenelg, C., Lord, D.C.L., M.R.S.L. The Albany, Piccadilly  
 1838 Glynn, J. Butterley, Derbyshire  
 1839 Godwin, G., jun., F.S.A. 11, Pelham-crescent, Brompton  
 1808 Goldingham, J., F.R.A.S., M.R.A.S. Worcester  
 1828 Goldsmid, Baron de and de Palmeira, F.S.A., F.L.S., F.G.S., F.R.A.S.,  
 M.R.S.L. Park-lodge, Regent's-park  
 1819 Gompertz, B., F.R.A.S. Kennington-terrace, Vauxhall  
 1846 Goodsir, J., Prof. of Anatomy, Univ. of Edinb. 21, Lothian-st., Edinburgh  
 1835 Gordon, J. A., M.D., Coll. Reg. Med. Socius. Pelican Life Assurance Office,  
 Lombard-street  
 1801 Gordon, Lieut.-General Sir J. W., Bart., K.C.B., G.C.H. Chelsea  
 1830 Gordon, H. P., M.A. Chelsea  
 1821 Gordon, T. Zante, Ionian Islands  
 1829 Goulburn, Right Hon. H., D.C.L. Montague-place, Portman-square  
 1843 Gould, J., F.L.S. 20, Broad-street, Golden-square  
 1831 Graham, Right Hon. Sir J. R. G., Bart. 46, Grosvenor-place  
 1836 Graham, T., M.A., *Vice-President*, Professor of Chemistry, University Col-  
 lege, London, F.G.S., &c. 9, Torrington-square  
 1846 Grainger, R. D., F.R.C.S., F.M.C.S. Highgate  
 1840 Grant, T. T. Royal Clarence Victualling-yard, Portsmouth  
 1836 Grant, R. E., M.D., F.R.S.E., F.L.S., &c. 10, Grafton-place, Euston-square  
 1817 Granville, A.B., M.D., F.G.S., M.R.A.S., &c. 109, Piccadilly  
 1832 Gravatt, W. 34, Parliament-street  
 1839 Graves, J. T., M.A., M.R.S.L. Poor Law Com. Office, Somerset-house  
 1832 Gray, J. E., F.G.S., F.R.G.S., &c. British Museum  
 1825 Green, J. H., Professor of Anatomy to the Royal Academy, F.G.S. Barnet  
 1807 Greenough, G.B., F.L.S., F.G.S., M.R.A.S. Grove-house, Regent's-park  
 1833 Greig, W., M.A. 14, Lower Belgrave-street, Eaton-square  
 1830 Gresswell, Rev. R., M.A. Worcester College, Oxford  
 1841 Grey, T. P., Earl de, K.G., K.P. 4, St. James's-square  
 1834 Griffith, E. 6, Nottingham-terrace, Marylebone  
 1806 Griffiths, J.  
 1840 Grove, W.R., M.A., V.P.R.I., Ph. D., Acad. Reg. Taurin. Corresp. et Soc.  
 Phil. Basil. 27, Upper Gloucester-place, Dorset-square  
 1839 Guest, E. 4, King's-bench-walk, Temple  
 1830 Guest, Sir J. J., Bart., F.G.S. 8, Spring-gardens  
 1839 Gulliver, G. Royal Regiment of Horse Guards  
 1818 Gurney, H., F.S.A., M.R.S.L. 9, St. James's-square  
 1827 Guthrie, G. J. 4, Berkeley-street, Piccadilly  
 1844 Haddington, Right Hon. T., Earl of, K.P. Tynningham Castle, Dunbar  
 1820 Hall, Sir J., Bart., F.R.S.E., F.G.S. 63, Lowndes-square  
 1832 Hall, M., M.D., F.R.S.E., Col. Reg. Med. Socius. 14, Manchester-square  
 1827 Hall, T. H., M.A. 49, Tavistock-square  
 1847 Hall, W. H., Capt. R.N. Shipbourne-lodge, Tunbridge  
 1821 Hallam, H., M.A., Trust. Brit. Mus., V.P.S., F.G.S., F.R.A.S., M.R.S.L.,  
 Instit. Reg. Sc. Paris. Socius. 24, Wilton-crescent, Knightsbridge  
 1839 Halliwell, J. O., Hon. M.R.I.A., F.S.A.L.&E., F.R.A.S., Hon. M.R.S.L., &c.  
 Avenue-lodge, Brixton-hill  
 1808 Hamilton and Brandon, A., Duke of, K.G., F.S.A. 12, Portman-square  
 1828 Hamilton, Rev. H. P., M.A., F.G.S., F.R.A.S. Wath Rectory, near Ripon  
 1818 Hamilton, W. R., V.P.S.A., V.P.R.S.L., &c. 12, Bolton-row, May-fair  
 1838 Hansler, Sir J. J., Knt., F.S.A. 8, Westbourne-street, Hyde-park-gardens  
 1824 Harcourt, Rev. W. V. V., M.A., Hon. M.R.I.A., F.G.S. Weldrake, near York  
 1838 Hardwick, J., D.C.L. 5 κ, Albany, Piccadilly  
 1831 Hardwick, P., R.A., F.S.A. 60, Russell-square  
 1847 Hardwicke, Earl of. Wimpole-hall, Arrington, Cambridge  
 1839 Hardy, P. 37, Old Jewry; and 10, Victoria-square, Pimlico  
 1823 Harford, J. S., D.C.L.  
 1844 Hargreave, C. J., B.L., Professor of Jurisprudence, University College,  
 London. 69, Chancery-lane



- 1835 Harris, J. G., M.A. 25, Chester-street  
 1831 Harris, Sir W. S., Knt. Windsor Villas, Plymouth  
 1845 Harrison, T. C. 31, York-terrace, Regent's-park  
 1825 Harvey, H., F.R.A.S. 59, Regency-square, Brighton  
 1835 Harvey, Major-General Sir R. J., C.B., K.T.S., K.S.B., F.S.A. United Service Club; and Mousehold-house, near Norwich  
 1827 Harwood, J., M.D., F.L.S. St. Leonard's, Hastings  
 1812 Hasted, Rev. H., M.A., F.L.S. Bury, Suffolk  
 1821 Haughton, Sir G. C., K.H., M.A., M.R.A.S., &c. 14, Grafton-street  
 1834 Hawkins, B., M.D., Col. Reg. Med. Socius. 30, Golden-square  
 1821 Hawkins, E., F.S.A., F.L.S. British Museum  
 1791 Hawkins, J.  
 1830 Hawkins, J. H., M.A., F.G.S. Reform Club  
 1835 Hawkins, Rev. W., B.L., M.A. 23, Great Marlborough-street  
 1814 Hay, R. W., F.S.A.  
 1818 Heath, G. C. Cambridge  
 1843 Heath, J. B., F.S.A. 66, Russell-square  
 1846 Henry, T. H. Brick-lane, Spitalfields  
 1834 Henry, W. C., M.D. Haffield, near Ledbury, Herefordshire  
 1840 Henwood, W. J. 4, Clarence-street, Penzance  
 1813 Herschel, Sir J. F. W., Bart., *Vice-President*, D.C.L., M.A., F.R.S.E., Hon. M.R.I.A., F.G.S., M.C.P.S., &c. Collingwood, near Hawkhurst, Kent  
 1843 Heygate, J., M.D. College-house, Derby  
 1843 Heywood, Sir B., Bart. 9, Hyde-park-gardens  
 1839 Heywood, J., F.S.A. Athenæum Club; and Acresfield, Manchester  
 1820 Higman, Rev. J. P., M.A., F.G.S., F.R.A.S. Rectory, Fakenham, Norfolk  
 1839 Hilton, J. 10, New Broad-street  
 1809 Hoare, C., F.S.A. 37, Fleet-street  
 1814 Hobhouse, Right Hon. Sir J. C., Bart., M.A. 42, Berkeley-square  
 1811 Hoblyn, T., F.L.S. White Barns, Buntingford, Herts  
 1841 Hodgkinson, E., F.G.S. 14, Salford-crescent, Manchester  
 1831 Hodgson, J. Birmingham  
 1839 Hogg, J., M.A., F.L.S., F.C.P.S., M.R.S.L. 12, King's-bench-walk  
 1837 Holland, C., M.D. 16, Queen-street, May-fair  
 1815 Holland, H., M.D., F.G.S., Coll. Reg. Med. Socius. 25, Brook-street  
 1826 Holman, J., Lieut. R.N., F.L.S. Windsor  
 1825 Holme, Sir E., Bart., Capt. R.N., F.S.A. 4, Queen Anne-street  
 1843 Hood, C., F.R.A.S. Earl-street, Blackfriars; and Camberwell  
 1847 Hooker, J. D., M.D. West Park, Kew  
 1812 Hooker, Sir W. J., K.H., LL.D., F.S.A., F.L.S., F.G.S. Kew  
 1834 Hope, Rev. F. W., M.A., F.L.S. 56, Upper Seymour-street  
 1837 Hopkins, W., M.A. Fitzwilliam-street, Cambridge  
 1841 Hoppus, Rev. J., LL.D., Ph. D. 39, Camden-street, Camden-town  
 1834 Horne, J. Clapham-common  
 1813 Horner, L., F.R.S.E., &c. Rivermede, Hampton-on-Wick  
 1828 Horsfield, T., M.D., F.L.S., F.G.S., M.R.A.S., &c. 43, Markham-square  
 1843 Hoskins, S. E., M.D. Guernsey  
 1821 Howard, L. Bruce-grove, Tottenham; and Ackworth-villa, Pomfret  
 1834 Hudson, R., F.G.S. Clapham-common  
 1818 Hume, J. 6, Bryanstone-square  
 1819 Hunt, Rev. G., M.A., F.S.A. Egg Buckland, near Plymouth  
 1837 Hunter, R., F.G.S., F.S.A. Highgate  
 1819 Hustler, Rev. J. D., B.D. Euston Rectory, near Thetford, Norfolk  
 1829 Hutchinson, Lieut.-col. G., E.I.C.S., Beng. Engineers  
 1844 Hyet, W. H. Painswick-house, Painswick  
 1838 Hymers, Rev. J., D.D. St. John's College, Cambridge  
 1813 Inglis, Sir R. H., Bart., *Vice-President*, D.C.L., Trust. Brit. Mus., Pres. Brit. Assoc. for Advanc. of Science, V.P.S.A., F.R.A.S. 7, Bedford-square  
 1807 Jacob, W., Inst. Sc. Paris. Corresp. 31, Cadogan-place, Sloane-street  
 1845 Jackson, Col. J. 52, Coleshill-street, Pimlico  
 1848 James, H., Capt. R. E. Portsmouth  
 1826 Jameson, R., F.R.S.E., Hon. M.R.I.A., F.L.S., F.G.S., &c. Edinburgh  
 1841 Jeffereys, J. 25 A, Norfolk-crescent, Hyde-park  
 1840 Jeffreys, J. G., F.L.S. Norton, near Swansea  
 1841 Jenkins, Sir R., G.C.B. India-house; and Bicton-hall, Shrewsbury  
 1821 Jennings, The Ven. Archdeacon, D.D. Hampstead-green

- 1838 Jervis, T. B., Major E.I.C.E., F.L.S., F.G.S., F.R.A.S. Clifton  
 1842 Jesse, J., F.R.A.S., F.L.S. Fordsham, Cheshire  
 1842 Johnson, C. W. 14, Gray's-inn-square  
 1836 Johnson, E. J., Captain R.N. Clement's-inn  
 1838 Johnson, Rev. G. H. S., M.A. Oxford  
 1846 Johnson, P. N., F.G.S. 38, Mecklenburgh-square  
 1810 Johnston, Right Hon. Sir A., Knt., F.S.A., V.P.R.A.S. 19, Great Cumberland-place; and York-house, Twickenham  
 1845 Johnston, A. R.  
 1837 Johnston, J. F. W., M.A., F.R.S., Professor of Chemistry and Mineralogy in the University of Durham. Durham  
 1846 Jones, H. B., M.A., M.D., Col. Reg. Med. Socius. 30, Lower Grosvenor-st.  
 1835 Jones, T., F.R.A.S. 62, Charing-cross; and West-square  
 1844 Jones, T. R., Professor of Comparative Anatomy, King's College. Colney-house, Finchley-common  
 1840 Jones, T. W. 35, George-street, Hanover-square  
 1840 Kater, E., F.G.S., M.R.I.A. Mexborough, Yorkshire  
 1846 Kay, J. H., Lieut. R.N.  
 1838 Kelland, Rev. P., M.A., F.R.S.E., M.C.P.S., Professor of Mathematics in the University of Edinburgh. Wardle, near Edinburgh  
 1822 Kidd, J., M.D., F.L.S., F.G.S. Oxford  
 1834 Kiernan, F. 30, Manchester-street, Manchester-square  
 1824 King, P. P., Captain R.N., F.L.S. Dunheved, New South Wales  
 1818 Kirby, Rev. W., M.A., F.L.S., F.G.S. Barham, near Ipswich  
 1830 Knowles, Sir F. C., Bart., M.A.  
 1810 König, C., K.H., Hon. M.R.I.A. British Museum  
 1843 Laing, Rev. D. 62, Mornington-road, Regent's-park  
 1845 Lankester, E., M.D., F.L.S. 22, Old Burlington-street  
 1811 Lansdowne, H., Marquis of, K.G., D.C.L., Trust. Brit. Mus., M.R.S.L. 52, Berkeley-square  
 1844 Larcom, T. A., Capt. R.E.  
 1848 Latham, R. G., M.D. Upper Southwick-street  
 1813 Lawrence, W. 18, Whitehall-place  
 1840 Lawson, H. 7, Lansdowne-crescent, Bath  
 1815 Leake, Lieut.-Colonel W.M., M.R.S.L., &c. 50, Queen Anne-street  
 1843 Le Couteur, Col. J. Belle Vue, Jersey  
 1831 Lee, J., LL.D., F.R.A.S. 5, College, Doctors'-commons  
 1830 Lee, R., M.D., Coll. Reg. Med. Socius. 4, Saville-row  
 1820 Lefevre, J. G. S., M.A., Vice-Chan. of the Univ. of London. Board of Trade  
 1848 Lefroy, J. H., Capt. R.A. Canada  
 1817 Legh, T., D.C.L. Lyme-park, Cheshire  
 1822 Lemon, Sir C., Bart. 46, Charles-street, Berkeley-square  
 1836 Lewis, T. L., Capt. R.E., F.G.S. Ibsley-cottage, Exeter  
 1811 Lincoln, J. K., Lord Bishop of. Cambridge  
 1828 Lindley, J., Phil. D., F.L.S., &c. 21, Regent-street  
 1832 Lister, J. J. Upton, Essex  
 1836 Llewelyn, J. D., F.L.S. Penllengare, Glamorgan  
 1818 Lloyd, E., Captain R.N. United Service Club  
 1830 Lloyd, Lieut.-Col. J. A., Surveyor-General. Port Louis, Mauritius  
 1834 Lloyd, Rev. W. F., M.A. Missenden, Bucks  
 1836 Lloyd, Rev. H., M.A., M.R.I.A. Dublin  
 1838 Locke, J. 6, Chester-terrace, Regent's-park  
 1811 Locker, E. H., F.S.A.  
 1810 Lonsdale, W., Earl of. 14, Carlton-terrace; and Lowther Castle, near Penrith  
 1841 Lovelace, W. K., Earl of. East Horsley-park, Ripley, Surrey  
 1834 Lowe, G. 39, Finsbury-circus  
 1829 Lubbock, Sir J. W., Bart., M.A., F.L.S., F.R.A.S., M.R.A.S. 23, St. James's-place  
 1826 Lyell, C., jun., M.A., F.L.S., F.G.S. 11, Harley-street, Cavendish-square  
 1826 Lyndhurst, J. S., Lord, D.C.L. 25, George-street, Hanover-square  
 1840 Littleton, G. W., Lord. 17, St. James's-pl.; and Hagley-park, Worcestersh.  
 1816 MacGrigor, Sir J., Bart., F.R.S.E., Coll. Reg. Med. Socius. 3, Harley-street  
 1815 Mackenzie, Sir G. S., Bart., F.R.S.E. Coul, Ross-shire  
 1827 Mackinnon, W. A., M.A., F.S.A., F.G.S. 4, Hyde-park-place  
 1831 Maclear, T., F.R.A.S., Astronomer Royal at the Cape of Good Hope  
 1839 Mackmurdo, G. W. St. Thomas's Hospital; and 7, New Broad-street

- 1838 Macneill, Sir J., F.R.A.S., M.R.I.A. 28, Rutland-square, Dublin  
 1848 M'William, J. O., M.D. Trinity-square, Tower-hill  
 1832 Madden, Sir F., K.H., Hon. M.R.I.A., F.S.A., &c. British Museum  
 1817 Maddy, Rev. J., D.D., F.S.A., F.R.A.S. Somertown, Bury St. Edmund's  
 1819 Magrath, Sir G., K.H., M.D., M.R.I.A., F.L.S., F.G.S. Plymouth  
 1827 Mahon, P. H., Viscount, D.C.L., P.S.A. 41, Grosvenor-place  
 1847 Maitland, J. G., M.A. 8, New-square, Lincoln's-inn  
 1839 Maitland, Rev. S. R. Lambeth-palace  
 1829 Maitland, E. F., F.S.A. Henley-on-Thames, Oxfordshire  
 1821 Majendie, A., F.G.S. Heddingham-castle, Castle Heddingham, Essex  
 1831 Manby, G. W., Capt. R.N. Yarmouth  
 1825 Mangles, J., Capt. R.N. 66, Cambridge-terrace, Edgeware-road  
 1825 Mantell, G. A., LL.D., F.L.S., F.G.S., &c. 19, Chester-square, Pimlico  
 1836 Marcet, F. Geneva  
 1816 Markland, J. H., F.S.A. Bath  
 1845 Martin, J. R., F.R.M. & C.S., M.R.A.S. 71 A, Grosvenor-street  
 1823 Maskelyne, A. M. S., M.A. Basset Down-house, Swindon  
 1846 Matheson, J. 13, Cleveland-row  
 1832 Mauley, W. F. S., Lord de. 24, George-street, Hanover-square  
 1829 Maxwell, Sir J., Bart. Pollock, Renfrewshire  
 1827 Mayo, Rev. C., B.D., F.S.A. Colesgrove, Hertfordshire  
 1835 Mayo, T., M.D., Col. Reg. Med. Socius. 56, Wimpole-street  
 1841 Melvill, J. C. East-India-house  
 1817 Melville, R., Viscount, K.T., F.R.A.S. 3, Somerset-place  
 1838 Merewether, Very Rev. J., D.D., Dean of Hereford, F.S.A. Hereford  
 1843 Miers, J. Temple-lodge, Hammersmith  
 1843 Miller, J. Monastery-cottage, East-India-road  
 1827 Miller, Lieut.-Col. G., C.B.  
 1845 Miller, W. A., M.D., Professor of Chemistry. King's College, London  
 1838 Miller, W. H., M.A., Professor of Mineralogy. Cambridge  
 1836 Minto, G. E. M. K., Earl of, F.R.A.S. Minto-castle, Roxburghshire  
 1835 Molesworth, Sir W., Bart. 1, Lowndes-square  
 1841 Monteagle (of Brandon), T., Lord, F.S.A. 37, Lower Brook-street  
 1845 Monteith, Maj.-Gen. W.  
 1836 Montefiore, Sir M., Knt. 7, Grosvenor-gate, Park-lane  
 1835 Moore, G., F.S.A., F.L.S. 64, Lincoln's-inn-fields  
 1846 Moore, Major J. A., F.S.A. 23, Park-crescent, Portland-place  
 1827 Moreau, C., Acad. Reg. Divion., Burd., et Masil., Socius. Paris  
 1835 Morgan, A. 26, New Bridge-street, Blackfriars  
 1832 Morgan, O. S., M.A., F.S.A. 70, Pall-mall  
 1819 Morier, J. 22, Charles-street, Berkeley-square  
 1842 Morison, Maj.-Gen. W., C.B., F.R.S.E. Oriental-club; or 16, Saville-row  
 1831 Morris, J. C. 9, Upper Hyde-park-street  
 1839 Moseley, Rev. H., M.A. Wandsworth  
 1830 Moss, J. W., M.B. Dudley  
 1847 Mountcashel, S., Earl of. Moore-park, Kilworth, Cork  
 1822 Mudge, R. Z., Lieut.-Col. R. E. Beechwood, Plympton, Devon  
 1826 Murchison, Sir R. I., G.C.St.S., M.A., V.P.G.S., F.L.S., &c. 16, Belgrave-sq.  
 1826 Mylne, W. C., F.R.A.S. New River-head  
 1820 Napier, H., Capt. R.N. Cadogan-place  
 1840 Narrien, J., F.R.A.S., Professor of Mathematics in the Royal Military College, Sandhurst. Sandhurst  
 1846 Neilson, J. B. Glasgow  
 1842 Newbold, T. J., Lieut. E.I.C.S. Madras  
 1846 Newport, G., F.L.S., F.R.C.S., &c. 30, Southwick-street, Oxford-terrace  
 1833 Nolan, Rev. F., LL.D., M.R.S.L. Prittlewell, Essex  
 1842 Norfolk, The Most Noble H., Duke of. 1, Hyde-park-place  
 1830 Northampton, S. J. A., Marquis of, F.S.A., Hon. M.R.I.A., F.L.S., F.G.S., &c. 145, Piccadilly  
 1823 Northumberland, A., Duke of, F.S.A. Northumberland-house, Strand  
 1840 Norwich, E. S., Lord Bishop of, President of the Linnean Society. 38, Lower Brook-street  
 1826 Ogle, J. A., M.D., F.R.A.S. Lord Lichfield's and Aldrich's Professor of Medicine, Oxford  
 1848 Oldham, T. Trinity College, Dublin  
 1835 Oliveira, B., F.S.A. 8, Upper Hyde-park-street



- 1824 Orford, H., Earl of. White's Club; and Wolterton-park, Norfolk  
 1819 Ormerod, G., D.C.L., F.S.A., F.G.S. Sudbury-park, Gloucestershire  
 1843 O'Shaughnessy, W. B., M.D. Calcutta  
 1838 Outram, B. F., M.D., F.R.G.S. 1, Hanover-square  
 1834 Owen, R., M.D., LL.D., F.L.S., V.P.G.S., &c. Royal College of Surgeons, Lincoln's-inn-fields  
 1845 Oxford, S. W., Lord Bishop of. 61, Eaton-place  
 1821 Palgrave, Sir F., K.H., Deputy Keeper of Her Majesty's Records. Rolls-yard, Chancery-lane; and Hampstead-green  
 1821 Paris, J. A., M.D., Pres. of the Royal College of Physicians. 27, Dover-st.  
 1824 Parish, Sir W., K.C.H., F.S.A., F.G.S.  
 1815 Parker, T. L., F.S.A. 34, Mount-street  
 1812 Parry, C. H., M.D. Bath  
 1821 Parry, Sir W. E., Knt., D.C.L., Capt. R.N., Hon. M.R.I.A., F.R.A.S., &c., Superintendent of Haslar Hospital. Gosport  
 1837 Partridge, R. 17, New-street, Spring-gardens  
 1816 Pasley, Maj.-Gen. C. W., R.E., C.B., F.R.A.S., F.G.S. 12, Norfolk-crescent  
 1818 Peacock, Very Rev. G., D.D., Dean of Ely, F.G.S., F.R.A.S. Deanery, Ely  
 1833 Pearson, Sir E., K.H., M.A. 5, Gloucester-terrace, Regent's-park  
 1819 Pearson, Rev. W., LL.D., F.R.A.S. South Kilworth, Northamptonshire  
 1826 Pearson, Sir W., Knt., M.D.  
 1832 Pechell, Sir S. J. B., Bart., Capt. R.N. 27, Hill-street, Berkeley-square  
 1822 Peel, Right Hon. Sir R., Bart., D.C.L., F.S.A., &c. Whitehall-gardens  
 1835 Pelly, Sir J. H., Bart. Trinity-house  
 1813 Pemberton, G. Bainbridge Holme, Durham; and 20, Edgeware-road  
 1827 Pendarves, E. W. W., M.A., F.G.S. 36, Eaton-place, Belgrave-square  
 1824 Penn, R. 6, Whitehall  
 1808 Pepys, W. H., F.L.S. 22, Poultry  
 1847 Percy, J., M.D. Birmingham  
 1838 Pereira, J., M.D., F.L.S. 47, Finsbury-square  
 1807 Petit, L. H., M.A., F.S.A., F.L.S., F.G.S., F.R.A.S., M.R.S.L. 9, New-square, Lincoln's-inn  
 1817 Petre, W. F. H., Lord. 3, Mansfield-street; and Thorndon-hall, Essex  
 1827 Pettigrew, T. J., F.S.A., M.R.A.S., &c. 8, Saville-row  
 1826 Phillip, A. P. W., D.M., Coll. Reg. Med. Socius, F.R.S.E.  
 1840 Phillimore, J., LL.D. 15, College, Doctors'-commons; and 22, Portman-st.  
 1819 Philipps, Sir T., Bart., M.A., F.S.A., F.G.S., Hon. M.R.S.L. Middle-hill, Worcestershire  
 1834 Phillips, B. 17, Wimpole-street, Cavendish-square  
 1834 Phillips, J., F.G.S. York  
 1822 Phillips, R., F.R.S.E. 6, Craig's-court, Charing-cross; and Camberwell  
 1848 Playfair, L. Hammersmith  
 1847 Plowden, W. H. C., F.R.A.S. 8, Devonshire-place  
 1829 Pole, W., M.A. 66, Brook-street  
 1816 Pollock, Right Hon. Sir F., Chief Baron of the Exchequer, K.H., M.A., F.S.A., F.G.S. Queen-square-house, Guildford-street  
 1848 Porrett, R. Ordnance-office, Tower  
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- Beaumont, T. W., F.H.S. 144, Piccadilly
- Belcher, Sir E., Capt. R.N.
- Bell, F. J. Woodlands, Essex
- Bell, M. Bourne-court, Kent
- Bell, T., F.R.S. & L.S. 17, New Broad-st.
- Bentley, John
- Berkeley, J. J. Uttoxeter
- Best, B. Withymoor-house, near Dudley
- Bettington, A. Bombay Civil Service
- Bicheno, J. E., F.R.S. & L.S. Col. Sec.,  
Hobart Town
- Bigge, C. W. Linden-house, Morpeth
- Bigge, T.
- Bigge, Capt. T. E. 19, Bryanston-sq.
- Bigsby, J. J., M.D. 24, Dorset-place
- Bilke, E. 12, Stamford-street
- Billing, A., A.M., M.D. 6, Grosv.-gate
- Bilton, Rev. W., M.A.
- Birch, J. B. 3, Cannon-row
- Black, J., M.D. Manchester
- Blackburn, E. B.
- Blackwell, Samuel
- Blackwell, T. E. Foxhangers, Wilts
- Blake, W., M.A., F.R.S. & H.S. 62, Port-  
land-place
- Blake, W. J., jun., F.R.S. 62, Portland-pl.
- Bland, M., F.R.S., S.A., L.S., & H.S.
- Bland, T.
- Blanshard, H., M.R.A.S. 37, Great  
Ormond-street
- Blencowe, R. W., M.A.
- Blount, W.
- Boase, H., M.D., F.R.S. Claverhouse,  
near Dundee
- Bodley, T. Anlaby-house, Pittville,  
Cheltenham
- Boileau, Sir J. P., Bart. 20, Upper  
Brook-street, Grosvenor-square
- Bolton, D., Lieut.-Colonel R.E., Canada
- Booth, J., M.D. Birmingham
- Botfield, B., M.P., F.R.S. & L.S. 9,  
Stratton-street
- Bowerbank, J.S., F.R.S. 3, Highbury-  
grove, Islington
- Bowles, W., F.L.S. & H.S.
- Braddyll, T. R. G.
- Braikenridge, G. W., F.S.A. Brisling-  
ton, near Bristol
- Brandram, T. Lee, near Blackheath
- Bravender, J. Cirencester, Gloucester
- Brayley, E. W., F.L.S. 12, East de Beau-  
voir-square
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- Breadalbane, J. C., Marquis of, F.R.S.  
21, Park-lane
- Brewster, Sir D., K.C.H., LL.D., F.R.S.  
St. Leonard's College, St. Andrew's
- Brickenden, R. T. W. L. Warminglid-  
house, Cuckfield, Sussex
- Briggs, Maj.-Gen. J., F.R.S., M.R.A.S.  
24, Conduit-street
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2, Raymond-buildings, Gray's-inn
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erley, near Gloucester
- Brogden, Rev. J., M.A. St. Alban's
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L.S. Oakley, near Kettering
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- Browne, Rev. R. W., M.A.
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S.A., & L.S. 12, Belgrave-square
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- Brunell, J. K. 11, Duke-st., Westmr.
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Bucks
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Milden-hall, Suffolk
- Bunbury, E. H., M.P., M.A. 15, Lincoln's-  
inn-fields
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Gibraltar
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gardens
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South Wales
- Cabbell, T. 1, Essex-court, Temple
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- Carne, J., F.R.S., M.R.I.A. Penzance
- Carnegy, C., M.D.
- Carpenter, W. B., M.D., F.R.S. 6, Re-  
gent's-park-terrace
- Cartmell, Rev. J. Cambridge

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 Chapman, T. Arundel-street  
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 Clarke, Sir C. M., Bart., M.D., F.R.S.  
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 Mold  
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 Ellis, Right Hon. Sir H., K.C.B., F.R.S.  
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- Evans, W., M.P. Park-house
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F.R.S. Winkfield
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- Falconer, T. Wootton, Hampshire
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- Fisher, J. C. Wood-hall, Cockermouth
- Fisher, Rev. J. H., M.A. Kirkby Lons-  
dale
- Fitch, R. Norwich
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- Fitzwilliam, C. W., Earl, F.R.S., S.A.,  
& H.S. Mortimer-house
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- Floresi, D. Mexico
- Floyer, J., B.A. Stafford
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D.C.L., F.R.S. & L.S.
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- Frere, E. Bitton
- Freshfield, J. W., F.R.S. Bank-street
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- Galton, Lieut. D., R.E. 20, Duke-street
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- Gibson, T. F. 31, Westbourne-terrace
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square
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 Stevenson, Allan, Edinburgh  
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 Bagnall, Thomas, Gold's-hill Iron-works, West Bromwich  
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 Hamilton, Lanarkshire  
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 Pimlico  
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 Greenwich  
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 Huntington, John Barker, Cam Hill-  
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 Hurwood, George, Ipswich  
 Ibbotson, D. J. H., Gainsborough  
 Illman, T., Old Quay Office, Manchester  
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 Jackson, G. B. W., 11, Upper Woburn-  
 place, Euston-square  
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 yard, Portsmouth  
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 Johnson, W., Grosvenor-wharf, West-  
 minster  
 Jones, John Edward, Liverpool  
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 Furness, Lancashire  
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 place, London-bridge  
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 Birmingham  
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 Liddell, Andrew, Pleau-house, near  
 Stirling



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 McIntosh, David, 39, Bloomsbury-sq.  
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 Mills, George, Southampton  
 Mitchell, Thomas Telford, Perth  
 Mitchell, W., Central Station, Newcastle  
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 Pim, James, Monkstown-castle, Dublin  
 Piper, T., jun., Grove-hill, Camberwell  
 Piper, William, 173, Bishopsgate-street  
 Pole, William, 29, Great George-street  
 Pollock, Fred., 35, Maddox-street, Regent-street  
 Pollock, G. K., 19, Essex-street, Strand  
 Porter, John Francis, Thames-bank  
 Price, Joseph Tregelles, Neath Abbey Iron-works, South Wales  
 Radford, W., Holyhead  
 Rankine, William John Macquorn, 5, North Charlotte-street, Edinburgh  
 Ransome, Robert, Ipswich  
 Ransome, James, Ipswich  
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 Ravenhill, Richard, Clapham-common  
 Rawlinson, Robert, Manchester  
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 Rickman, William Charles, 21, Park-side  
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 Rigaud, Rev. S. J., Little Dean's-yard, Westminster  
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 Robertson, A. J., 4, New Bridge-street, Newcastle-on-Tyne  
 Robinson, Henry, Eaton-lodge, Pimlico  
 Robinson, Henry G., 6, Half-Moon-st.  
 Robinson, Henry Oliver, Millwall  
 Roe, John, Sewers Off., Hatton-garden  
 Roe, John P., Rhymney Iron-works, Abergavenny  
 Roney, Cusack Patrick, Hanover-gate, Regent's-park  
 Roomsalecoq, Andrew Henry, Ceylon  
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 Sayce, W., Osborne-ho., Abergavenny  
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 Scott, M., Adelphi-chambers  
 Selby, G., Smethwick Grove, Birmingham.  
 Shaw, J. C., Queen-st.-wharf, Bristol  
 Shears, William, Lawn, South Lambeth  
 Simms, William, 136, Fleet-street  
 Simons, Gerritt, the Hague, Holland  
 Slate, A., Woodside Iron-works, Dudley  
 Smith, Sir Fredk., Maj.-Gen., Chatham  
 Smith, S. W., 24, Essex-street, Strand  
 Smith, John T., Major M.E., Madras  
 Smith, O. H., Distillery, Thames-bank



Smith, F. P., Admiralty, Somerset-ho.  
 Snow, Bernard, 4, North-street, Westmr.  
 Sorensen, Bergarius, Norway  
 Sowerby, William, jun., 52, Parliamt.-st.  
 Spence, William, 50, Chancery-lane  
 Stephenson, R. M., 8, Broad-st.-bldgs.  
 Stevens, J. J., Southwark-bridge-road  
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 Brighton  
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 Taylor, J., 35, Lower Belgrave-place  
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 Belgrave-road, Pimlico  
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 Stoke, Devonport  
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 Calcutta  
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 Upward, A., Gas-works, Curtain-road  
 Vanderkiste, W., 28, India-st., Glasgow  
 Vetch, James, Capt. R.E., 15, Duke-st.,  
 Westminster  
 Vignoles, Hutton, 4, Trafalgar-square  
 Vint, H., St. Mary's-lodge, Colchester

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 Wallace, John, University, Durham  
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 Kentish-town  
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 Commission, Duke-street, Westmr.  
 Watson, John, Lancaster  
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 White, John B., jun., 17, Millbank-st.  
 Whitmore, William R., 5, George-street  
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 Wilkins, Robert, 24, Long-acre  
 Wilkins, William Crane, 24, Long-acre  
 Williams, Alfred, 33, Wimpole-street  
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street, Upper Chelsea  
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tenham-court-road  
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inn-fields  
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cashire; and 9, Portland-place  
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Pancras-road  
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William-street, City  
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Bettridge, J., jun. 6, Halkin-street,  
Belgrave-square  
Betts, E. L. 29, Tavistock-square  
Bevan, W. 5, Martin's-lane, City  
Beyers, C. Atlas Works, Manchester  
Birch, G. Horley Lodge, Horley, Surrey  
Bird, G. Hammersmith; and New Inn,  
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Portland-place  
Blashfield, J. M. 3, New London-street,  
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Bodkin, W. H. 8, Mansfield-street,  
Portland-place  
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St. John's-wood  
Bone, W., jun. 76, Fleet-street  
Bonner, J. G. 7, Furnival's-inn  
Booker, T. W. Velindra House, Cardiff  
Borthwick, M. A. 26, Charles-street,  
Haymarket  
Bosanquet, A. 32, Fenchurch-street  
Botfield, B., M.P., F.R.S., F.S.A. Nor-  
ton Hall, near Daventry, Notts; and  
10, Sackville-street

- Bowen, J. H. 4, Somerset-place, Somerset-house  
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 Braby, J., jun. 18, Cranmer-place, Waterloo-bridge-road  
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 Brae, A. E. Park-square, Leeds  
 Braithwaite, J. 39, Bedford-square  
 Branston, R. E. 36, St. Andrew's-hill, Doctors'-commons  
 Brett, A. 3, Furnival's-inn  
 Brewer, W. 2, Malcoln-place, Lark-hall-lane, Clapham  
 Brewster, E. 47, Burton-crescent  
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 Brookes, W. 25, Mark-lane  
 Brooman, R. A. 166, Fleet-street; and Paris  
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 Brown, R. Etruria, Staffordshire  
 Browne, Major H., E.I.C.S. 28, Soho-square  
 Browning, J. 113, St. John-street  
 Brunel, I. K. 18, Duke-st., Westminster  
 Buckmaster, J. E. Parkhurst, Isle of Wight  
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 Bunn, L. 19, Walbrook  
 Burch, W. Sewardstone, Essex  
 Burges, A. 23, Great George-street, Westminster  
 Burgess, W. R. 107, Strand  
 Burt, H. P. 238, Blackfriars-road  
 Burton, B. A. 9, Nelson-square, Blackfriars-road; and Holland-st., Southw.  
 Burton, H. M. Ditto; ditto  
 Burton, D., F.G.S., M.R.I. 6, Spring-gardens  
 Butler, J. L. Dale-street, Liverpool  
 Butler, T. 4, Cheapside  
 Button, C. Holborn-bars  
 Clarendon, Earl of. 1, Grosvenor-crescent, Belgrave-sq.; and Watford, Herts  
 Clifford, H., Lord. Ugbrooke-park, near Chudleigh, Devon  
 Colborne, Right Hon. Lord (V.P.). 19, Hill-street  
 Codrington, Admiral Sir E., Bart. (V.P.), G.C.B., F.R.S., &c. 92, Eaton-square  
 Curtis, Sir W., Bart. Netheravon-house, Amesbury, Wilts  
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 Cabbell, B. B., M.P., F.R.S., &c. 1, Brick-court, Temple  
 Caldicott, A. Woodford-hall, Woodford, Essex  
 Caldwell, Capt. W. 3, Audley-square  
 Calthrop, R. G. 2, Pump-court, Temple  
 Campbell, D. Emlyn-cottage, Newcastle-Emlyn, South Wales  
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 Campbell, W. N. Kingsdown, near Farnham, Kent  
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 Carey, F. S. 21, Bloomsbury-street, Bedford-square  
 Carlisle, J. E. Hampstead  
 Carpmael, W. 4, Old-sq., Lincoln's-inn  
 Castell, J. 45, Prince's-st., Leicester-sq.  
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 Chadwick, E. 4, Stanhope-street, Hyde-park-gardens  
 Chantrell, R. D. 21, Lincoln's-inn-fields  
 Chaplin, W., jun. 12, Gloucester-road, Regent's-park  
 Chapman, H. 2, Up. Charles-st., Westm.  
 Chawner, T. 66, Guildford-street, Russell-square  
 Chowne, H. St. Swithin's-lane, City  
 Christy, J. F. Glass-works, Stangate  
 Chubb, J. St. Paul's-churchyard  
 Claridge, J., M.D. Pershore, Worcestershire  
 Claridge, G. B. Court-house, Walbrook  
 Clark, F. Haslewood, Birmingham  
 Clark, T., F.R.S. Ordn.-office, Pall-mall  
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 Clarke, R. 27, Finchley-road., St. John's-wood  
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 Clothier, J. W. C. Street, near Glastonbury  
 Cluff, G. 24, Steward-street, Spital-sq.  
 Cobbett, R., jun. 25, Northumberland-street, Strand  
 Colby, T., Col. R.E., LL.D., F.R.S., L. & E. Athenæum Club  
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 Cole, H. 1, Terrace, Kensington  
 Coles, J. Old Park, Clapham; and Old Change  
 Coles, W. 3, Charing-cross  
 Collard, G. Walthamstow, Essex  
 Colman, J. Stoke, Holy Cross, Norwich  
 Colnaghi, D. Pall-mall East  
 Colquhoun, J. 12, St. James's-place, St. James's-street  
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 Cooper, W. 53, Union-pl., Aberdeen  
 Cooper, W. D. C. Toddington-manor, Dunstable, Bedfordshire  
 Cope, F. 7, Lothbury, City



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 Cory, W. 5, Manor-place, Brixton  
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 Courtney, W., jun. 54, Oxford-terrace, Hyde-park  
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 Craddock, T. 36, Broad-street, Birmingham  
 Crampton, T. R. 10, Buckingham-street, Strand  
 Crane, H. S.  
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 Creswick, T., A.R.A. Linden-grove, Bayswater  
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 Cubitt, W., M.D. Gray's-inn-road  
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 Easton, J., jun. Ditto  
 Easton, P. S. Ditto  
 Eborall, C. London-road Railway Station, Manchester  
 Edwards, G. 37, Gt. George-st., Westm.  
 Edwards, G. Rye, Sussex  
 Edwards, J. Newenden, Staplehurst, Kent  
 Edwards, W. 27, Upper Charlotte-street, Fitzroy-square  
 Eliot, E. J. 4, Elm-grove, Peckham  
 Ellerby, J.  
 Ellis, J., M.D. Sudbrook-park, Petersham, Surrey  
 Elliott, J. H. 4, Martin's-la., Cannon-st.  
 Errington, J. E. Adam-street, Adelphi  
 Etchells, J. Gas-works, Ashton-under-Lyne  
 Evans, F. G. Gas-works, Horseferry-road, Westminster  
 Everett, W. Chase-side-house, Enfield  
 Fairbairn, P. Leeds  
 Fairbairn, W. Manchester  
 Faraday, M., D.C.L., F.R.S., &c. Royal Institution  
 Farey, J., C.E. 67, Guildford-street  
 Farrance, G. J., F.S.A. 47, Mount-street, Berkeley-square  
 Fenn, J. 105, Newgate-street

- Field, J., F.R.S. Cheltenham-place, Lambeth  
 Fillans, J. 82, Baker-street  
 Fisher, A. L., M.D. 10, Pall-mall East  
 Fisher, R. 35, Queen-sq., Bloomsbury  
 FitzCook, H. 13, New Ormond-street  
 Fothergill, B. Globe Works, Manchester  
 Foster, P. le N., M.A. 92, Chancery-la.  
 Fowler, F. E. H., M.I.B.A. 21, Saville-row, Burlington-gardens  
 Fowler, J. 2, Queen-sq.-pl., Westminster  
 Fox, C., C.E. 8, New-st., Spring-gards.  
 Franks, G. Blackfriars-road  
 Freeman, S. Coventry  
 Frodsham, E. 84, Strand  
 Fry, P. W. 14, Montague-street, Russell-square  
 Fuller, F. 29, Abingdon-street, Westminster; and Streatham  
 Fuller, J. G. 28, St. James's-street  
 Fuller, R. W. Croydon-lodge, Croydon  
 Granville, Earl (V.P.). 16, Bruton-st.  
 Grey, Right Hon. Earl. Belgrave-square  
 Goldsmid and De Palmeira, Baron de (V.P.). St. John's-lodge, Regent's-pk.  
 Guest, Sir J. J., Bart., M.P. 8, Spring-gardens; and Dowlais, Merthyr Tydvil  
 Gibson, Right Hon. T. M., M.P. 49, Wilton-crescent  
 Galbraith, W. Percy-cottage, South Lambeth  
 Gambart, J. E. 25, Berners-street, Oxford-street  
 Gardiner, J. R. Duchy of Cornwall, Somerset-house  
 Gardiner, T. Golden-cross-hotel, Charing-cross  
 Garling, H. 27, Bedford-row  
 Garrard, S. Pantion-street, Haymarket  
 Garrett, G. K. 9, Albion-pl., Blackfriars  
 Garrett, R. Leiston Works, near Saxmundham, Suffolk  
 Gass, S. H. 166, Regent-street  
 Gaury, J. 80, Watling-street  
 Geary, S.  
 Gibbons, J. 345, Oxford-street  
 Gibson, E., jun. Hull  
 Gibson, T.  
 Gilbert, J. W. The London and Westminster Bank, Lothbury  
 Gillett, W. S. 51, Woburn-place  
 Gladstone, T. M. 16, South John-street, Liverpool  
 Glasscock, —. Bishop's Stortford, Herts  
 Glover, T. 47, Myddelton-square  
 Glynn, J., F.R.S., &c. 28, Westbourne-park-villas, Bayswater  
 Goding, J. 2, Belgrave-square  
 Goldsmid, A. A. 8, Cavendish-square  
 Goldsworthy, J. H. High-street-place, Stepney  
 Gooch, J., C.E. Railw. Stat., Nine-elms  
 Gooch, J. H. Grove-lane, Camberwell  
 Good, W. 5, Charlotte-street, Blackfriars-road  
 Goodwin, C. Lynn, Norfolk  
 Gorden, A. T., C.E. Fludyer-street  
 Gordon, R. Stockport, Lancashire  
 Gore, H. Chartered Gas-works, Horse-ferry-road, Westminster  
 Gosnell, J. Three Kings'-court, Lombard-street  
 Gotto, E. 63, Albany-st., Regent's-pk.  
 Graham, J. Mayfield, Manchester  
 Grainger, T., C.E. Edinburgh  
 Green, J. G. 19, St. James's-street  
 Greene, H. 43, Baker-st., Portman-sq.  
 Gregory, C. H. 1, Delahay-st., Westminster  
 Grenada, Agricultural and Horticultural Society of the Island of  
 Grenfell, C. P. 38, Belgrave-square  
 Grisbrook, W. Teunterden, Kent  
 Grove, C. 150, New Bond-street  
 Guise, J. 75, Margaret-street, Wilming-ton-square  
 Gunter, R. Lowndes-street; and Stanmore-hill, Middlesex  
 Gurdon, W. Hill-house, East Bergholt, Suffolk  
 Gwilt, G., F.S.A. 8, Union-st., Boro'  
 Howard, Right Hon. C. W. G. 56, Park-street, Grosvenor-square  
 Habberfield, R. 21, Eastcheap  
 Haddan, J. C. 29, Bloomsbury-square  
 Hagen, E. Dockhead  
 Hailstone, E. Horton-hall, Yorkshire  
 Hale, W. Orange-street, Southwark  
 Hale, W. S. 73, Queen-street, City  
 Hall, G. F. 15, Norfolk-street, Middlesex Hospital  
 Hall, J. Great George-street, Ratcliffe-highway  
 Hall, S. Athenæum Club  
 Hallows, W. 32, Tavistock-square  
 Hamer, J. 158, High Holborn  
 Hamilton, O. 15, James-street, Buckingham-gate  
 Hammond, W., jun. 9, Queen-square, Bloomsbury  
 Hancock, J. L. Goswell-mews, Goswell-road  
 Hanhart, M. 64, Charlotte-st., Rathbone-place  
 Hardcastle, J. 22, Eastcheap  
 Harding, J. D., D.C.L. The College, Doctors'-commons  
 Harding, J. D. 3, Abercorn-place, Maida-hill, St. John's-wood  
 Harding, W. South-Western Railway Station, York-road, Lambeth  
 Hardisty, E. B. 43, Gt. Marlborough-st.  
 Hardwick, P., R.A. 60, Russell-square  
 Hardy, R. W. H., Lieut. R.N. Sion-hill, Bath  
 Harrison, G. 16, Carlton-house-terrace  
 Harrison, H. 1, Percy-street, Rathbone-place  
 Harrison, J. 3, Grosvenor-gate, Park-la.  
 Harrison, T. R. St. Martin's-lane  
 Harrison, R. 19, Friday-street, City  
 Hart, S., R.A. 16, Russell-place, Fitzroy-square

- Harvey, J. K. 25, Ely-place, Holborn ; and 18, Trigon-place, Clapham-road  
Hatchard, Rev. T. G. Rectory, Havant  
Hawes, B., jun. M.P. 9, Queen-square, Westminster  
Hawes, W. 17, Montague-place, Russell-square  
Hawkins, B. W. 57, Cambridge-street, Hyde-park-square  
Hay, D. R. 90, George-st., Edinburgh  
Hayward, J. P. 88, Newgate-street  
Heberden, T., M.D. 11, Upper Brook-street, Grosvenor-square  
Helbert, J. H. 60, Gloucester-place, Portman-square  
Henderson, A. Gloucester-pl., Hyde-pk.  
Hendrie R. 12, Tichbourne-street  
Henson, H. H. Elm-cottage, East-lane, Pinner  
Heseltine, S. Stock Exchange  
Hetley, J. H. 35, Soho-square  
Hewitt, D. P. 23, Great George-street  
Hewitt, F. K. Old Hummums, Covent-garden  
Hick, J. Bolton  
Hickson, S. Highgate  
Higgins, J., M.R.I. 6, Albert-terrace, Upper Holloway  
Highton, E. Clarence-villa, Gloucester-road, Regent's-park  
Hill, C. 23, Hyde-park-square  
Hinde, H. P. Hall-staircase, Inner Temple  
Hippisley, J., B.A. Stone-Easton, near Bath  
Hislop, C. 20, Gutter-lane, City  
Hoare, C., F.R.S., &c. 37, Fleet-street  
Hoare, D. J.  
Hoblyn, T., F.R.S. White Barns, near Buntingford, Herts  
Hobson, G. H. 17, Cornhill  
Hodge, P. K. 140, Strand; and Albion-grove, Barnsbury-park  
Hoffstaedt, A. V. Bridge-st., Blackfriars  
Holford, J. Holford-ho., Regent's-pk.  
Holland, J. Ranelagh Works, Belgrave-square  
Holland, W. 19, Marylebone-street  
Hollier, R., F.S.A., &c. 12, Great Winchester-street; and Greenwich  
Hollins, M. D. Stoke-upon-Trent  
Holmes, J. 4, New Ormond-street  
Holtzapfel, Mrs. Long-acre  
Hope, H. T., M.P. 116, Piccadilly  
Horne, H. 26, Montague-square  
Horton, J. 28, Devonshire-st., Queen-square  
Horsfall, H. Vauxhall Foundry, Liverpool  
Howard, D. 6, Torrington-place, Torrington-square  
Howe, G. 119, Guildford-st., Borough  
Hoy, H. B. 14, Pancras-vale  
Hubert, S. M. West-hill, Wandsworth  
Hughes, J. Albert-road, Sydenham  
Hughes, W. H., F.S.A. 12, King's-bench-walk, Temple  
Hunt, J. 31, Parliament-street  
Humby, G. Carlton-chambers, Regent-street  
Hume, J., M.P. 6, Bryanston-square  
Hutchinson, W. East Temple-chambers  
Ilchester, Earl of. 31, Burlington-st.  
Ibbetson, Capt. B. Clifton-ho., Brompton  
Ivory, T. 4, Old-square, Lincoln's-inn  
Jackson, A. R., M.D. Warley, near Brentwood, Essex  
Jackson, Rev. W. Pitsford, near Northampton  
Jeanes, J. 67, New Bond-street  
Jee, A. S. 6, John-street, Adelphi  
Jenkins, C. 4, Horner-street, Lambeth  
Jennens, T. H., jun. Birmingham  
Jennings, G. 29, Great Charlotte-street, Blackfriars-road  
Jennings, J. R. Wanstead, Essex  
Jenour, J. 3, Eden-place, Gravesend  
Jobson, J. Holly-hall, Dudley  
Jobson, J. Sheffield  
Johnson, A. 7, Gresham-street West  
Johnson, H. 39, Crutched-friars, City  
Johnson, W. Millbank-row, Westminster  
Johnstone, J. Willow-park, Greenock  
Jones, R. L. Highbury  
Jones, J. 338, Strand  
Jones, O. 9, Argyle-place, Regent-st.  
Jordan, T. B. Belvedere-rd., Lambeth  
Judkins, E. Beaufort-buildings, Strand  
Jutsum, H. 174, Edgeware-road  
Keith, G. 11, Princes-st., Leicester-sq.  
Kelsey, R. 73, Chiswell-street  
Kemble, H. Chester-place, Hyde-park  
Kemp, G. T. 35, Spital-square  
Kendall, H. E. 17, Suffolk-street, Pall-mall East  
Kerr, Mrs. 67, Grosvenor-square  
Kingsford, C. 37, Crutched-friars  
Kingsford, E. London and Westminster Bank, Southwark Branch  
Knight, C. 90, Fleet-street  
Lansdowne, Marquis of (V.P.), F.R.S., &c. 54, Berkeley-square  
Lonsdale, Earl of, F.R.S., &c. 15, Carlton-terrace  
Laing, D. G. 2, Villiers-street, Strand  
Lancaster, C. W. 151, New Bond-st.  
Langdon, A. 28, Great Russell-street, Bloomsbury  
Langley, J. C. Gloucester-pl., Greenwich  
Lapworth, A. 19, Old Bond-street  
Laurence, F. 36, Tavistock-street  
Laurie, J. 1, Hyde-park-place  
Law, T. 30, St. Swithin's-lane  
Lawes, Capt. R. N. Sussex-sq., Hyde-pk.  
Lawson, H. 7, Lansdowne-cres., Bath  
Laxton, W. 10, Fludyer-st., Westminster  
Leach, G. 16, Marlborough-place, St. John's-wood  
Leaf, W. 39, Old-change  
Le Couteur, Col. Island of Jersey  
Lee, C. 20, Golden-square  
Lee, J. F., LL.D. Doctors'-commons  
Lee, S. H. Dalston



- Leeks, E. F. 21, Queen's-road, Gloucester-gate, Regent's-park  
 Lefevre, J. S. House of Lords  
 Le Mann, F. 15, Threadneedle-street  
 Leon, J. A. Kenwood-cottage, Norwood  
 Levey, G. Great New-st., Fetter-lane  
 Levien, S. New South Wales  
 Lewis, S., jun. 195, Regent-street; and Roehampton  
 Lewis, T.  
 Lindley, N. Acton-green, Turnham-green  
 Lindley, W., C.E. 8, Royal-ter., Adelphi  
 Lister, W. 15, Manchester-buildings, Westminster  
 Little, G. 3, Furnival's-inn  
 Lloyd, D. 19, Friday-street, City  
 Lloyd, Lieut.-Col. J. A., F.R.S. Athenæum Club  
 Lobb, W., M.D. 12, Aldersgate-street  
 Locke, J., M.P. 11, Adam-st., Adelphi; and 6, Chester-terrace, Regent's-park  
 Lockett, J. Fennell-street, Manchester  
 Long, W. Preshaw-house, near Bishops' Walton, Hants  
 Lott, T. 43, Bow-lane, Cheapside  
 Low, R. 330, Strand  
 Lowe, G., F.R.S. 39, Finsbury-circus  
 Lowry, J. W. 45, Robert-street, Hampstead-road  
 Loyd, S. J. 22, Norfolk-st., Park-lane  
 Lund, H. Hare-court, Temple  
 Manvers, Earl. 13, Portman-square  
 M'Adam, Sir J. 22, Whitehall-place  
 M'Dougall, A. 44, Parliament-st., West.  
 Macgrigor, W. F. Vauxhall Foundry, Liverpool  
 Mackerness, T. 37, West-sq., Southwark  
 Macleise, D., R.A. 14, Russell-place, Fitzroy-square  
 Macpherson, R. 76, Lombard-street  
 Magrath, E. Athenæum, Pall-mall  
 Mair, G. 18, Charlotte-st., Bedford-sq.  
 Margetson, J. 17, Cheapside  
 Marriott, J. Dewsbury, Yorkshire  
 Marshall, E. S. 31, John-street, Tottenham-court-road  
 Martin, S. D. Flower-bank, Burley, near Leeds  
 Martineau, W. H.  
 Masters, T. 294, Regent-street  
 Matthews, W. 367, Strand  
 Maudslay, T., C.E. Cheltenham-place, Westminster-road  
 Maw, S. 31, Aldersgate-street  
 Mawley, H. 20, Gower-street  
 May, C. Ipswich, Suffolk  
 Mercer, C. Ashford, Kent  
 M'Ewen, R. H.M.S. Amphion  
 M'Clean, J. R. 17, Great George-street, Westminster  
 M'Glashan, A. 16, Long-acre  
 Medley, F. 59, Glo'ster-road, Hyde-park-gardens  
 Meeking, C. Streatham; and Holborn-hill  
 Meinertzhagen, D. 10, Moorgate-street  
 Merle, W. H. 24, Lansdowne-place, Cheltenham  
 Messenger, S. Birmingham  
 Meyer, C. P. Enfield  
 Middleton, J. St. Stephen's, Norwich  
 Miles, C. 96, Great Russell-street  
 Miller, T. E. 1, Alfred-pl., Bedford-sq.  
 Minton, H. Stoke-upon-Trent  
 Moffatt, G., M.P. 85, Eaton-square  
 Moore, G., F.R.S. 64, Lincoln's-inn-fields  
 Moore, J. 45, Goswell-road  
 Morgan, J. 27, Hoxton-square  
 Morgan, O., M.P., F.R.S. 9, Pall-mall  
 Morrell, G. F. 149, Fleet-street  
 Morrison, J., M.P. 57, Upper Harley-st.  
 Morson, T. N. R. Southampton-row, Russell-square  
 Morton, F. Walton-on-the-Hill; and North John-street, Liverpool  
 Mortimer, J. Hanover-square  
 Mortlock, J. 250, Oxford-street  
 Mortlock, W. 18, Regent-street  
 Morton, J. C. Whitfield, Berkeley, Gloucester  
 Mott, I. H. R., D.M., M.D. 76, Strand; and 48, Norland-square, Notting-hill  
 Moulton, S. 32, Chester-street, Grosvenor-place  
 Mudge, Col. R. E. Buckwood, Plympton, Devon  
 Mulready, W., R.A. 1, Linden-grove, Kensington  
 Munday, G. 26½, Abchurch-lane, City  
 Munday, J. 26½, Abchurch-lane, City  
 Murchison, J. H. 10, Holles-street, Cavendish-square  
 Murdoch, R. 1, Upper Vernon-street, Lloyd-square  
 Murrey, A., jun. 35, Craven-st., Strand  
 Musgrave, T. 6, Gordon-square  
 Northumberland, Duke of, F.R.S., Northumberland-house, Charing-cross; and Alnwick-castle, Northumb.  
 Norfolk, Duke of, K.G., Norfolk-house, St. James's-square; and Arundel-castle, Sussex  
 Northampton, Marquis of (V.P.), F.R.S. Piccadilly; and Castle Ashby, Northamptonshire  
 Northesk, Earl of. Winchester, Hants  
 Nasmyth, G. 18, Great George-street, Westminster  
 Neeld, J., M.P. 6, Grosvenor-square  
 Newall, R. S. Gateshead  
 Newington, S., M.D. Knole Frant, near Tunbridge-wells  
 Newton, W. 66, Chancery-lane  
 Newton, W. E. 66, Chancery-lane  
 Nicoll, D. B 2, Albany, Piccadilly; and Old-fields, Acton, Middlesex  
 Normanville, W. G. Glynn-cottage, Park-village East, Regent's-park  
 Nurse, W. M. St. Alban's-lodge, Dyke-road, Brighton



- Orkney, Earl of. Taplow-court, near Maidenhead  
 Olive, J. 4, York-terrace, Regent's-pk.  
 Osborne, S., jun., F.L.S. 4, Stockwell-park, Brixton  
 Oxenford, J. 16, John-st., Bedford-row  
 Portland, Duke of, F.R.S. Harcourt-house, Cavendish-square  
 Phipps, Col. Hon., C.B. Windsor-castle  
 Page, T. 3, Eccleston-square  
 Palmer, P. 118, St. Martin's-lane  
 Palmer, W. H. 24, Bedford-row  
 Parry, T. 38, Bloomfield-road  
 Parry, T. G. Higham-court, Gloucester  
 Paxton, A. F. 10, Buckingham-st., Strand  
 Payne, E. J. 2, Bennett's-hill, Birming.  
 Payne, J. Inner Temple-lane, Temple  
 Payne, W. New Bond-street  
 Paynter, J. 64, Coleman-street  
 Pellatt, A. Holland-street, Blackfriars  
 Pennethorne, J. 7, Whitehall-yard  
 Pepys, J. 8, Lower Berkeley-street  
 Pepys, W. H., F.R.S. 11, Earl's-terrace, Kensington  
 Percival, R., F.S.A. 76, Lombard-st.  
 Perkins, A. M. Francis-street, Gray's-inn-road  
 Perry, G. 39, Spencer-street, Northampton-square  
 Perry, R. W. 6, Sussex-ter., Hyde-pk.  
 Peto, S. M., M.P. Russell-square  
 Phillips, H. 24, Long-acre  
 Phillips, H. Wyndham; and 8, George-street, Hanover-square  
 Phillips, W. P. 359, Oxford-street  
 Picciotto, M. H. 3, Dean-street, Finsbury-square  
 Pierce, W. 5, Jermyn-street  
 Pihl, O. 49, Hollywell-street, Vincent-square, Westminster  
 Pilgrim, C. H. Bear-place, near Maidenhead  
 Platow, W. 55, High Holborn  
 Platt, J. 22, Park-square East, Regent's-park  
 Pledge, E. V. 311, Cheapside, Birming.  
 Plomley, F., M.D. Maidstone  
 Plomley, J. F. Rye, Sussex  
 Pole, W., F.R.S. 18, Old-square, Lincoln's-inn  
 Powell, N. Glass-works, Whitefriars  
 Powell, A. Ditto  
 Powles, J. D. 6, York-pl., Portman-sq.  
 Prevost, J. L., Consul of the Swiss Confederation. Gresham-street, City  
 Prideaux, F. S. Southampton  
 Prinsep, W. H. 30, Gloucester-gardens, Westbourne-terrace  
 Prior, E. 48, York-terrace, Regent's-pk.  
 Proctor, J. 18, Cheapside  
 Prosser, R. 1, Cherry-st., Birmingham  
 Provis, W. A., C.E. The Grange, near Ellesmere, Salop  
 Pryor, W. S. 23, Broad-st.-build., City  
 Russia, His Imperial Majesty the Emperor of Radnor, Earl of (V.P.), F.R.S. 52, Lower Grosvenor-street  
 Romney, Earl of (V.P.), F.R.S. Murdstone  
 Radcliff, Sir J., Bart. Rudding-park, Wetherby, Yorkshire  
 Rennie, Sir J., F.R.S. Whitehall-place  
 Rothschild, Sir A., Bart. Grosvenor-house, Grosvenor-place; and Newcourt, St. Swithin's-lane  
 Ross, Sir W. C., R.A. 38, Fitzroy-sq.  
 Ramsden, R. 7, Brook-street, Holborn  
 Randell, G. 41, Burton-crescent  
 Rastrick, J. U., C.E. 51, Eaton-square  
 Rea, E. 115, Wardour-street  
 Redgrave, R., A.R.A. Hyde-park-gate South, Kensington-gore  
 Redgrave, S. Hyde-park-gate South, Kensington-gore  
 Reeves, J., F.R.S. and F.L.S. Clapham  
 Reeves, J. R., F.R.S. and F.L.S. King's-arms-yard, Coleman-street  
 Reid, W. 25, University-street, Tottenham-court-road  
 Rendel, J. M., C.E. 8, Great George-street, Westminster  
 Reveley, G. J. 17, Queen-sq., Bloomsb.  
 Reveley, H. W. Sunny-hill, Parkston, Poole, Dorset  
 Reveley, W. A. 17, Queen-sq., Bloomsb.  
 Reynolds, T. 45, Devonshire-street, Portland-place  
 Ricardo, J. L., M. R. (V.P.). 31, Lowndes-square  
 Ricardo, M. Brighton; and 2, King-street, St. James's-square  
 Rich, C. Palace-row, New-road  
 Richardson, B. Wordsley Works, Stour-bridge  
 Richardson, J. Ditto  
 Richardson, W. 7, St. George's-terrace, New Kensington  
 Roberts, D., R.A. 7, Fitzroy-street  
 Robinson, J. 7, Gower-st., Bedford-sq.  
 Robinson, J. Berkhamstead  
 Rock, J., jun. 6, Stratford-pl., Hastings  
 Rofe, J. Winkley-square, Preston  
 Roget, P. M., M.D. 18, Up. Bedford-pl.  
 Romilly, E. 14, Stratton-street  
 Rose, W. Newcastle-street, Strand; and Coalport, Shropshire  
 Ross, A. 2, Featherstone-bdgs., Holborn  
 Rotch, B. (V.P.). 1, Furnival's-inn, Holborn  
 Roughton, L. 28, York-place, City-rd.  
 Rouse, R. Grove-lane, Camberwell  
 Rowe, J. B. Brentford  
 Rundell, W. W. Polytechnic Society, Falmouth  
 Rush, G. Elsingham-hall, Bishops' Stortford  
 Russell, H. H. 2, Derby-street, Parliament-street  
 Russell, J. J. 81, Upper Ground-street, Blackfriars  
 Russell, T. H. Ditto

- Rutter, J. O. N. Black-rock, Brighton  
 Sutherland, Duke of (V.P.), K.G., Staf-  
 ford-house  
 Stanhope, Earl, 20, Charles-street,  
 Berkeley-square  
 Smart, Sir G. 91, Great Portland-street  
 Salomons, A. 22, Cambridge-street,  
 Hyde-park  
 Salomons, D., Alderman of the City of  
 London. Shorter's-court  
 Samuelson, M. Post-office, Banbury  
 Saunders, J. E. 16, Finsbury-square  
 Saunders, J. E., jun. 3, Terrace, Ken-  
 nington-common  
 Saunders, T. Hammersmith  
 Saunders, T. W. 6, Charing-cross  
 Saunders, W. W. East-hill, Wands-  
 worth  
 Saward, M. 9, Chatham-pl., Blackfriars  
 Schneider, R. Naseby-lodge, Welford,  
 Northamptonshire  
 Scholey, W. Stockwell-common  
 Scholfield, W. F. Leeds  
 Scott, H. E. 14, Gray's-inn-square  
 Scott, J. A. 13, Pall-mall East  
 Scott, H. D. 10, Eccleston-st., Pimlico  
 Scrivener, R. Alurpton Tile-works,  
 Acton, Middlesex  
 Sex, E. Stock Exchange  
 Seymour, W. Brighton  
 Sharpe, E. 2, Devonshire-terrace, Mary-  
 lebone  
 Shears, D. T. Bankside  
 Shephard, C., jun. 53, Leadenhall-st.  
 Sheppard, R. Newport Pagnell  
 Sheriff, G. W. Streatham-hill; and 61,  
 Friday-street  
 Shore, O. Upper Clapton  
 Shuter, T. A. Hooley-house, Colsden,  
 Surrey  
 Sich, H. Chiswick  
 Siemens, W. Summerfield-cottage, Bir-  
 mingham-heath, Birmingham  
 Silverlock, H. 3, Wardrobe-terrace,  
 Doctors'-commons  
 Simpson, J., C.E. 29, Great George-  
 street, Westminster  
 Simpson, W. B. 456, Strand  
 Skeat, W. 6, Park-place-villas, Maida-  
 hill West  
 Smirke, E. 3, King's-bench-wlk., Temple  
 Smirke, S. 24, Berkeley-square  
 Smith, B. Staunton-hall, near Derby  
 Smith, C. H. 39, Clipstone-street  
 Smith, G. Frederick's-place, Old Jewry  
 Smith, G. Cornhill  
 Smith, G. 29, Finsbury-square  
 Smith, H., C.E. 25, Parliament-st., West.  
 Smith, J. 45, Jermyn-street  
 Smith, J. S. Whitechapel Distillery  
 Smith, J. 49, Long-acre  
 Smith, J. J. Roscoe-place, Sheffield  
 Smith, R. P. Avenue de St. Cloud 29,  
 Paris  
 Smith, W. 69, Princes-st., Leicester-sq.  
 Smith, W. H. 10, Norfolk-st., Strand  
 Smithies, T. B. Gutta Percha Company,  
 City-road  
 Solly, E. 33, Bedford-pl., Russell-sq.  
 Solly, H. Tipton, near Birmingham  
 Solly, J. Tipton, near Birmingham  
 Solly, R. H., F.R.S. 48, Gt. Ormond-st.  
 Solly, W. H. Surge-hill, near King's  
 Langley, Herts  
 Sopwith, T. Chapel-pl., Duke-st., West.  
 Speer, E. Treasury  
 Spence, W. 50, Chancery-lane  
 Spiers, R. J. Oxford  
 Standige, W. 36, Old Jewry  
 Stapylton, M. Myton-hall, Borough-  
 bridge  
 Staunton, M. 9, Strand  
 Staunton, W. S. 9, Strand  
 Stephenson, R., M.P. (V.P.), C.E. 24,  
 Great George-street, Westminster  
 Storey, W. J. C. 12, Marlborough-place,  
 St. John's-wood  
 Strutt, E. 43, South-st., Grosvenor-sq.  
 Strang, Dr. The Town-hall, Glasgow  
 Sutton, R. Royal Exchange  
 Symonds, A. 6, Adelphi-terrace  
 Taber, J. Herne-hill  
 Talbot, T. M. Penric-castle, Glamor-  
 ganshire  
 Tanqueray, C. Vine-st., Bloomsbury  
 Taylor, J., jun. Queen-st.-pl., Southw.  
 Taylor, J. 11, St. George's-place,  
 Knightsbridge  
 Taylor, J., jun. 22, Parliament-street  
 Tebbitt, W. Cottage-house, Clapham-  
 common  
 Tebery, J. 41, Gracechurch-st., City  
 Tennant, J. 149, Strand  
 Tenniel, J. B. 30, Blandford-square  
 Terni, V. 3, Crown-court  
 Thackeray, W. M. 18, Young-street,  
 Kensington  
 Thom, J. Manchester  
 Thomas, J. Richmond-villa, Park-place,  
 Paddington  
 Thomson, A. 25, New Bond-street  
 Thompson, J. 1, Camden-hill-terrace,  
 Kensington  
 Thompson, R. G. Kirby-hall, near  
 Boroughbridge  
 Thorne, J. M., jun. Turret-house,  
 South Lambeth  
 Thornton, J., C.E., F.G.S. The Grange,  
 Gargrave, Skipton, Yorkshire  
 Thornton, J., jun. Ditto  
 Thorold, W. Norwich  
 Thurston, J. Catherine-street, Strand  
 Thurston, S. 9, Southampton-street,  
 Bloomsbury  
 Tite, W., F.R.S. Lowndes-square  
 Todd, J. R. 11, John-street, Adelphi  
 Todd, W. R. Trueby-house, Woodford  
 Tomason, G. 60, Shaftesbury-street,  
 New-north-road  
 Topham, C. 157, Whitecross-street  
 Topham, T. Ripley, near Alfreton, Derby  
 Tuck, J. H. 2, St. James's-square

- Tulloch, J., F.R.S., &c. 16, Montague-place, Russell-square  
 Turner, T. Streatham-hill  
 Twining, H. Grove-house, Clapham-common  
 Twining, R., F.R.S. 13, Bedford-place, Russell-square  
 Twining, T., jun. Perryn-house, Twickenham  
 Underwood, J. 25, Eastcheap  
 Uwins, T. (V.P.), R.A. Victoria-road, Kensington  
 Urling, G. F. 224, Regent-street  
 Van Voorst, J. Paternoster-row  
 Varley, C. 1, Charles-st., Clarendon-sq.  
 Varnish, E. Hyde-park-gate-villas, South Kensington  
 Varty, T. 31, Strand  
 Vaughan, G. 28, Cumberland-terrace, Regent's-park  
 Vaughan, P. 70, Fenchurch-street  
 Veitch, J., M.D. 6, Ovington-square, Brompton  
 Vint, H. St. Mary's lodge, Colchester; and 14, Berners-street  
 Vivian, B. T. T. Crownan, Cornwall  
 Vulliamy, B. L., F.R.A.S. 68, Pall-mall  
 Willoughby de Broke, Lord. 21, Hill-street, Berkeley-square  
 Waite, H. Church-st., Stoke Newington  
 Wakefield, J. C. 20, Friday-street, City  
 Waley, S. W. 22, Devonshire-place  
 Walker, J. (V.P.), F.R.S. 23, Great George-street, Westminster  
 Wall, A. 1, India-row, East-India-road  
 Waller, E. 49, Fleet-street  
 Walters, D. 14, Wilson-street, Finsbury  
 Ward, W. A 3, Albany, Piccadilly  
 Warner, A. Jewin-crescent  
 Warren, A. Grove, Kentish-town  
 Warriner, H. Engineers'-office, Railway Station, Coventry  
 Wass, C. W. 8, Adam-street, Adelphi  
 Waterhouse, A. 1, St. Paul's-churchyard  
 Watson, J. W. Latymore-lodge, Hammersmith  
 Watts, F. 1, Warwick-squ., Belgrave-rd.  
 Wetherby, J. 6, Old Burlington-street  
 Webb, C. L. 14, Burton-crescent  
 Webb, E. B. Castle Lecky, Newtown, Limavady, Derry  
 Webb, J. 5, Old Bond-street  
 Webster, T., M.A. (V.P.). 2, Pump-court, Temple  
 Webster, T., R.A. The Mall, Kensington  
 Webster, W. B. 48, Charing-cross  
 Weedon, T. 41, Hart-st., Bloomsbury  
 Westall, R. 115, Lower Thames-street  
 Westley, W. 24, Regent-street  
 Whatman, J., M.A.S. Vinters, Maidstone  
 Whishaw, H. 3, Gray's-inn-square  
 Whishaw, F. 9, John-street, Adelphi  
 White, G. F. Millbank-street  
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 Whittingham, C. Chiswick  
 Wigg, F. 7, Bedford-row  
 Wigg, G. 61, Westbourne-ter., Hyde-pk.  
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 Wilkinson, W. A. Beckenham-street  
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 Wilks, J. Watling-street  
 Wilks, J. 3, Harley-pl., Regent's-pk.  
 Williams, W. 6, Road-lane, City  
 Willich, C. M. 24, Suffolk-street, Pall-mall East  
 Willock, P. Ladyshore, Terra Cotta Works, Manchester  
 Wilmot, Capt. F. E., Commanding Company of Gentlemen Cadets. Woolwich  
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 Wilson, G. 26, St. Martin's-court  
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 Wilson, L. P. 11, King's-arms-yard, Moorgate-street  
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 Winkworth, T. 25, Colebrook-row, Islington  
 Winsor, F. A. 57, Lincoln's-inn-fields  
 Wire, D. W. 9, St. Swithin's-lane, City  
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 Woolnorth, T. A. 49, Upper Charlotte-street, Fitzroy-square  
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 Yates, J. A. 33, Bryanston-square  
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## ROYAL CORNWALL POLYTECHNIC SOCIETY.

THIS Society was founded in the year 1833, and has the honourable distinction of having been the first of its kind in this kingdom, and of having led to the institution of several of a similar name and character in different parts of England. It originated in a suggestion from Miss Fox, daughter of Mr. R. Were Fox, of Falmouth, that an exhibition of specimens of the Fine and Industrial Arts should be held in that town, at which prizes should be given, “to stimulate the ingenuity of the young, to promote industrious habits among the working classes, and to elicit the inventive powers of the community at large.” The idea was warmly seconded by the principal inhabitants of the neighbourhood, and the Society was speedily inaugurated as a county institution, under the patronage of Lord de Dunstanville, and the presidency of Sir C. Lemon, Bart., M.P., with some of the leading men of Cornwall for its officers.

It may be expected that, in a part of the kingdom which has for so long a period been remarkable for the mechanical skill displayed in its mining operations, the attention of the Society would be soon directed to this department; and we find, at its first annual meeting, that premiums were offered by Charles Fox, Esq., of ten guineas, five guineas, and three guineas, for the best improvements on the methods of ascending and descending in mines; and a premium of 10*l.* by Sir C. Lemon and Robert Were Fox, Esq., for the best series of experiments tending to prove how the dangers attendant upon blasting rocks may be most effectually and economically guarded against. In succeeding years similar premiums, and others having relation to the different interests of the county, were offered by the Society and its members; and the number of ingenious inventions and interesting papers which were received in competition for them, showed at once the success and great utility of the Society.

In 1835, on the death of the first patron, H. M. William IV. consented to hold this office; the celebrated Davies Gilbert, president of the Royal Society, having previously accepted the office of vice-patron, and taking also an active part in the proceedings at the annual exhibitions of the Society.

In the Annual Report for 1835 appeared a paper on the diseases of miners, by Dr. Carlyon, and two on the Pilchard fishery; one of these

was by the accomplished ichthyologist, Jonathan Couch, Esq., F.R.S. Other papers on the diseases of miners followed, and tended to strengthen the feeling of the importance of relieving this industrious class of men from the fatigue of climbing from great depths. Premiums were repeatedly offered and awarded for perfecting the models of machinery intended for this purpose, which had been submitted to the judges at the exhibitions; and eventually several of the members offered, through the medium of the Society, a premium of 500*l.* to the mine adventurers who should first introduce the man-machine invented by Mr. Michael Loam; and a further premium of 50*l.* was offered by the Rev. Canon Rogers to the engineer who should erect the same to the satisfaction of the judges. The first premium was awarded in 1843 to the adventurers in Tresavean mine, and the smaller premium to the inventor of the machine for putting it to work in a satisfactory manner. This machine has been carried to a depth of about 300 fathoms. Another premium was then offered, of 103*l.*, to the mine which should introduce the second man-machine. This was awarded in 1845 to the adventurers in the United Mines, who have introduced the machine to the depth of more than 200 fathoms. Premiums for further improvements in these machines, and also for the best essay on the vital and economical effects resulting from their introduction, are still offered by the Polytechnic Society.

The great importance of this machine, both to the miner and the adventurer, may be easily shown. It has been calculated that a miner, in descending to his work at the bottom of Tresavean mine, and again climbing to the surface by ladders, expends one-fifth of the time, and exhausts a much larger proportion of the force he is able to expend in daily labour. If a miner weighs 150 lbs., and ascends the 280 fathoms in one hour, he exerts a force equal to raising 4,200 lbs. a foot high in a minute, or rather more than one-eighth of the estimated power of a horse, an expenditure of strength which must have a very injurious effect on the health of a man who has been working for some hours in the moist, dense, and hot atmosphere of a mine. In fact, only the youngest and strongest miners are able to work in the deep levels and afterwards climb to the surface. The late Captain W. Francis considered that the whole of the miners at the United Mines worked at the average depth of 200 fathoms, and that the time actually saved by the machine is about half an hour per man and boy for each descent and ascent, and is worth to the mine fully 800*l.* per year. This is probably not one-third of the real gain which has been effected by the introduction of the man-machine in this mine; a similar remark will also apply to Tresavean; and when it is considered what a relief it must be to the poor miner who has been working at his laborious occupation at a temperature varying from 70° to 90° Fahrenheit, to be raised to the surface without the great and wasting exertion which has been mentioned,—an exertion which tends so much to produce and aggravate those pulmonary complaints so common and so fatal to the mining population,—the advantages which have resulted from the invention and introduction of this machine must be very apparent.

If this were the only good which had originated in the Polytechnic Society, it would well deserve the support which it receives; but the number of ingenious inventions and improvements which are brought every year to its exhibitions, and a large portion of which relate to mining machinery and operations, shows that to the mining interest it must be particularly

useful. This will be more apparent when it is considered that nearly one-half of the papers in its Annual Reports relate to subjects of importance to the miner, as will be seen by the following brief synopsis of the contents of its first seventeen Annual Reports:—

Papers relating to mechanical inventions and improvements			
connected with mining operations	..	..	38
Papers relating to health of miners and mining statistics	..	..	13
„ the man-machine	..	..	8
„ steam and the steam-engine	..	..	10
„ other mining subjects	..	..	12
„ fisheries and agriculture of Cornwall	..	..	9
„ natural history of Cornwall	..	..	20
„ statistics of Cornwall	..	..	8
„ scientific and mechanical subjects not included in the above	..	..	67

For obvious reasons, our notice of this Society has been confined to its relations to mines and mining; but it is by no means ineffective in its other departments. In fact it has been in accordance with its name, *Polytechnic*. The fine arts appear to have always been a favourite section; and among several artists whose early productions were introduced to public notice by its exhibition, and whose talents were fostered and stimulated by its rewards, are Mr. Silas Rice, now at the head of one of the Government schools of design, and Mr. N. N. Burnard, the sculptor. Of upwards of 2,300*l.*, exclusive of medals, which have been awarded as premiums and prizes by this Society, more than 800*l.* have been given in the fine art department.

Besides the sections which have been named are others for naval architecture, statistics, natural history, school productions, and fancy-work. The school department is invariably a very interesting portion of the annual exhibition.

The success which has attended this Society from its commencement is undoubtedly owing, in a great degree, to the fostering care of Sir C. Lemon, the Messrs. Fox, Mr. Enys, the Messrs. Taylor, and other gentlemen who have taken part in its management, and assisted as judges at the annual exhibitions; but it must be manifest that, unless both mechanical and artistic skill existed in the county, and was really stimulated, encouraged, and developed by this institution, it would not, after a lapse of seventeen years, still take rank among the first of the provincial institutions of this kingdom, whether it be estimated by its reputation, the number of its subscribers, or the amount of its income.

The number of subscribers, at present, is about 350, and the income of the Society 400*l.* per annum; and it is worthy of remark that the rate of subscription is so low as not to exclude the practical mechanic, being only 5*s.* per year. The average amount subscribed is about 10*s.* per year, but many of its members give 2*l.* 2*s.* annually. Each subscription gives a proportionate number of tickets of admission to the annual exhibition. Some of the mines of the county also make annual donations to its funds, but not so many as might be expected from the character and objects of the Society.

It must not be omitted that her most gracious Majesty has been patroness of the institution for many years, and that his R. H. Prince Albert is vice-patron.

## GLOSSARY OF TERMS

USED IN THE MINING DISTRICTS OF DEVON, CORNWALL, DERBYSHIRE,  
STAFFORDSHIRE, NORTHUMBERLAND, DURHAM, ETC., WITH  
THOSE EMPLOYED IN THE FOREIGN MINES.

To which are added,

SMELTING TERMS, AND THOSE ASSOCIATED WITH THE SCIENCES OF  
GEOLOGY, MINERALOGY, AND METALLURGY.

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CORNWALL AND DEVON.

- Acicular*—From *acicula*, a needle, signifying long slender crystals.
- Adit level*—An horizontal excavation, whereby the water from above that level, and drawn from the bottoms of the mine, is conveyed.
- Adventurers*—Those who have shares in a mine. According to Pryce, in his *Mineralogia Cornubiensis*, *In*-adventurers are shareholders who attend to the working, and supply goods; *Out*-adventurers are those who pay their *quota* without attending to the management or benefit by supplying materials.\*
- Aggregated*—Where the component parts adhere, and may be easily separated; also when crystals are closely connected, they are said to be aggregated.
- Air-machine*—An apparatus for forcing fresh air into, or withdrawing foul air from, badly-ventilated places.
- Air-pipes*—Tubes or pipes of iron or wood for ventilating underground, or for the conveyance of fresh air into levels having but one communication with the atmosphere, and, consequently, no current of air existing.
- Aitch-piece*—That part of a plunger lift in which the clacks are fixed.
- Alliaceous*—The garlic odour of arsenical minerals when heated or struck.
- Amorphous*—Without any determinate form.
- Anhydrous*—Without water of crystallization.
- Arch*—A piece of ground left unworked.
- Arched*—The roads in a mine, built with stone or brick.
- Argillaceous*—Consisting of clay.
- Arborescent or Dendritic*—Ramifying like a tree.
- Arseniate*—The arsenic acid united with a base, as copper in the arseniate of copper.
- Attile*—Rubbish, refuse of the mine, containing little or no ore.
- Average produce*—The quantity of fine copper contained in the several parcels of ore raised from a mine, or sold at "ticketing."
- Average standard*—The average standard, or rate, at which a parcel of ores, at ticketing or otherwise, is sold. See *Standard*.
- Axis of a crystal*—The lateral planes surround its axis, which is an imaginary line passing down the middle of the prism from the centre of the upper to that of the lower terminal plane.

\* This is not the case at the present moment, *In* and *Out*-adventurers being alike interested.



- Back**—The back of a lode, or that part nearest the surface from the point of working. That of a level is the part of the lode above.
- Bal**—The miner's term for a mine.
- Batch of ores**—Certain quantity of ore sent to the surface by any *pare* of men.
- Bar of ground**—A vein of a different description of rock, crossing the lode or "country."
- Base**—The substance to which an acid is united; the bottom or lower part.
- Bearers**—Supports to the pumps in the engine-shaft.
- Beat away**—To excavate, a term usually applied to hard ground.
- Bed**—A seam, or horizontal vein of ore.
- Bend**—Indurated clay; a name given by miners to any indurated argillaceous substance.
- Bit**—The steeled end of a borer.
- Black jack**—Blende.
- Blende, also called Willd**—One of the ores of zinc, composed of iron, zinc, sulphur, silix, and water; on being scratched it emits a phosphoric light.
- Black tin**—Tin ore previous to smelting, as obtained from the mine.
- Blast holes**—The holes through which the water enters the "windbore," or bottom of a pump.
- Block tin**—Metallic tin.
- Blast**—The air introduced into a furnace.
- Blasting**—Forcing off portions of rock by means of gunpowder. A hole is made with a borer, into which gunpowder is inserted, then tamped or confined, and ignited.
- Blower**—A smelter.
- Bounds**—The proprietary of tin ore over a given tract.
- Bob**—The engine beam.
- Boulders**—Large stones or pebbles.
- Botryoidal**—Globular forms, such as are found in copper, &c.
- Borer**—A boring instrument, with a piece of steel at the end, called a boring bit.
- Brace**—The platform placed *over* the mouth of a shaft, or winze, to which the tackle is fixed.
- Branch**—A small vein which strikes out from the lode, and very generally again unites therewith.
- Brood**—Impurities mixed with the ores.
- Broil or Bryle**—The traces of the presence of a lode, found in the loose matter, at or near the surface.
- Buckers**—Bruisers of the ore.
- Bucket**—The piston of the lifting-pump.
- Bucket-lift**—A set of iron pipes attached to a lifting-pump.
- Bucket-rods**—Wood rods, to which the piston of the lifting-pump is attached.
- Bucking-iron**—The iron or tool with which the ore is pulverized or broken down.
- Bucking-plate**—An iron plate on which the ore is placed for being bucked.
- Buddling**—Separating the ores from the earthy substance by means of an inclined hutch or cistern.

- Bunch, or Squat of ore*—A quantity of ore of small extent; more than a stone, and not so much as a course.
- Burden, or overburn*—The substances reposing on a bed of stream tin or surface covering the lode.
- Burning-house*—The furnace in which tin ores are calcined to sublime the sulphur from pyrites; the latter being thus decomposed, are more readily removed by washing.
- Burrow*—A heap of deads, attle, rubbish.
- Button*—The result of an assay in fine copper.
- Cage of a whim*—The barrel on which the rope is wound.
- Cal*—Wolfram.
- Cand or Kand*—Fluor.
- Capel*—A stone composed of quartz, schorl, and hornblende, usually occurring on one or both walls of a lode, and more frequently accompanying tin than copper ores.
- Captain*—One of the superintendents of the mine.
- Captain dresser*—Superintendent of the dressing of the ores.
- Capillary*—Long hair-like substances (viz., native silver) are so called.
- Carrack*—See *Capel*.
- Cases of Spar*—Veins of quartz (not containing ores) which have not a direction parallel to the lodes.
- Casing*—A division of wood planks, separating the footway, in a whim, or engine-shaft, from one another, also dividing the shaft, so as to admit the pumps, and for drawing the ores or attle to surface.
- Cathead*—A small capstan.
- Caunter lode*—A lode which forms a considerable angle with the ordinary direction of the other lodes in its vicinity.
- Cellular*—Composed of cells formed by the intersecting of the laminæ and lamellæ.
- Champion lode*—The main or principal lode in a mine.
- Charger*—An instrument in the form of the bit of a carpenter's auger, for charging holes for blasting, which are driven horizontally.
- Chimning*—A process of similar effect to tossing, but being performed on small quantities of ore, the keeve is supported on the verge of its bottom.
- Clack*—The valve of a pump of any description.
- Clack door*—The aperture through which the clack of a pump is fixed and removed.
- Claying*—Lining the hole (in which gunpowder is to be placed) with clay, to prevent the powder becoming damp.
- Cob*—To break the ores with hammers in such a manner as to separate the dead or worthless parts.
- Cockle*—Schorl.
- Coffin*—Old workings open to the day.
- Cost-book*—The book employed in Cornish mines carried on upon the cost-book system. Mines so worked are in no way affected by the Joint Stock Companies' Registration Act, but are regulated by the laws of the Stannaries. The plan is to insert in the "cost-book" the name and address of each of the adventurers who first work the mine, with all subsequent transfers of shares, and every expense attached to the undertaking, which being entered in the cost-book, a meeting is held every two months, when the purser presents his accounts, made

up for that period, and the shareholders are thus enabled to judge of the profitable nature or otherwise of the undertaking, before incurring further liabilities; while any one feeling dissatisfied, may, on paying his proportion of the debts due, "sign his name off the cost-book," as it is termed, whereby he ceases to be liable for any future costs, and is entitled to his proportion of value of ores, machinery, &c. See article treating hereon, where the subject is treated on more fully.

*Country*—The strata or rock through which the vein or lode traverses.

*Course of ore*—A portion of the lode containing a regular vein of ore.

*Cover*—The box into which the ore is removed; also the place at the head of the trunk, in which the slimes are by agitation mechanically suspended in water, in the process of trunking.

*Crib, or Curb*—A circular frame of wood, screwed together, as a foundation for bucking or pulverizing ore in a shaft.

*Creases*—Divisions of buddled work.

*Cross-course*—A lode or vein intersecting or crossing a lode at right angles, or any other direction, and which frequently throws the lode out of its regular course.

*Cross-course spar*—Radiated quartz.

*Cross-cut*—A level driven at right angles, to take or intersect the lode.

*Crop*—The best ore.

*Crushing*—Grinding the ores without water.

*Cuneiform*—Wedge-shaped.

*Cube*—A solid figure, contained under six equal squares.

*Cupelo*—A small furnace.

*Cut*—To intersect by driving, sinking, or rising.

*Costeaning*—Discovering lodes by sinking pits on backs of lodes, or in their vicinity, and driving transversely to intersect them.

*Chats*—Small heaps of ore.

*Cofering*—Securing the shaft from the influx of water by ramming clay, &c.

*Collar of a shaft*—The timber by which its upper parts are kept from falling together.

*Collar launder*—The pipe or gutter at the top of a lift of pumps through which the water is conveyed to the cistern.

*Conchoidal* relates only to fracture: compact minerals are more or less conchoidal.

*Connection or Connecting rods*—The larger rods which are attached to the engine-beam.

*Core*—Miners usually work six hours at a time, and, consequently, four *pare* of men are required for the twenty-four hours—"forenoon core," from 6 A.M. to noon—"afternoon core," from noon to 6 P.M.—"first core by night," from 6 P.M. to midnight—and "last core by night," from midnight to 6 A.M.; occasionally the work is performed by eight-hour cores.

*Dam*—Choke damp, foul air.

*Deads*—Attle or rubbish.

*Dead-ground*—That portion of a lode in which there is no ore.

*Dean*—The end of a level or cross-cut.

*Decrepitate*—When a mineral exposed to heat flies with a crackling noise.

*Dendritic*—See *Arborescent*.



- Dialling*—Surveying underground or at surface for the purpose of laying down plans or sections.
- Dileuing, or Terluing*—Washing ores supported on a hair-bottomed sieve in water.
- Dippa*—A small pit.
- Dish*—That portion of the produce of a mine which is paid to the land-owner or lord as rent or royalty, usually ranging from  $\frac{1}{12}$  to  $\frac{1}{24}$ .
- Dissueing*—Is when the lode is small and rich, to break down the strata from one of its walls, by which means it can afterwards be taken away without being deteriorated, and without waste.
- Disseminated*—Imbedded in the mass of another substance.
- Dowsing-rod*—The hazel rod of divination, by which some pretend to discover lodes.
- Dropper*—A branch when it leaves the main lode, or falls into the lode from the "country."
- Draft-engine*—An engine used for pumping.
- Drawing-engine or whim*—That employed for drawing ores or attle to surface.
- Dredge or Dredging ore*—A stone impregnated, or traversed by minute veins or strings of ore.
- Driving*—Digging or excavating horizontally.
- Drift*—The excavation made for a road underground.
- Dressers*—Cleaners of the ore.
- Durns*—A frame of timber with boards placed behind it, to keep open the ground in shafts, levels, &c.
- Dzhu, or Hulk*—To dig away a portion of the rock, &c. on one side of the lode or end, that the blast may be more efficient.
- Elvan*—Porphyry, clay, stone, generally accompanying cross-courses.
- End*—The further extent of a level or cross-cut.
- Engineer*—The superintendent of the machinery.
- Engine-man*—Man who attends to and works the engine.
- Engine-shaft*—The pit or shaft by which the water is drawn by the engine from the lower parts of the mine, to the adit or surface.
- Efflorescence*—Minutely fibrous.
- Fast*—The firm rock beneath the diluvium.
- Fang*—A niche cut in the side of an adit, or shaft, to serve as an air-course; sometimes a main of wood pipes is denominated a fanging.
- Feeder*—A branch when it falls into the lode.
- Flang*—A two-pointed pick.
- Flat-rods*—Rods for communicating motion from the engine horizontally.
- Floran tin*—Tin ore scarcely perceptible in the stone; tin ore stamped very small.—(*Pryce*.)
- Flookan*—A soft clayey substance, which is generally found to accompany the cross-courses and slides, and occasionally the lodes themselves.
- Fluke*—The head of the charger; an instrument used for cleansing the hole previously to blasting.
- Footwall*—Is the wall under the lode; it is sometimes also called the underlaying wall.
- Footway*—The ladders by which the workmen ascend and descend.
- Forcepiece*—A piece of timber put in a level, shaft, &c., in a diagonal position, for keeping the ground open.



- Fork*—"Water in fork," water all drawn out; the bottom of the engine-shaft.
- Friable*—Easily crumbled or broken down.
- Furnace*—The place in which the ore is placed for the purpose of smelting or reduction.
- Gad*—A pointed wedge of a peculiar form, having its sides of a parabolic figure.
- Geode*—A hollow ball.
- Glist*—Mica.
- Good-levels*—Levels driven nearly horizontal.
- Gossan*—Oxide of iron and quartz, generally found in the backs of lodes near to surface, or occurring at shallow depths.
- Grass*—The surface.
- Grain-tin*—Crystalline tin ore; metallic tin smelted with charcoal.
- Grate*—Stamps grate; a metallic plate pierced with small holes; it is attached to the stamps, and through the holes the stamped ores escape.
- Griddle, or Riddle*—A sieve.
- Grinder*—Machinery for crushing the ores between iron cylinders or barrels.
- Growan*—Decomposed granite; but sometimes applied to the solid rock.
- Ground*—The country; the stratum in which the lode is found.
- Gulph of ore*—A very large deposit of ore in a lode.
- Gunnies*—Levels or workings.
- Gurt*—A gutter; a channel for water.
- Halvanner*—The dresser of, or operator on, the halvans.
- Halvans*—The ores which are not sufficiently rich to be offered for sale until the impurities with which they are mixed are removed by dressing.
- Hanging-wall*—The wall or side over the lode, in contradistinction to "footwall."
- Hauling*—Drawing ore or attle out of the mine.
- Head-sword*—The water running through the adit.
- Heave*—The horizontal dislocation which occurs when one lode is intersected by another having a different direction. A right or left hand heave is when the part of the intersected lode on the opposite side of the traversing vein is found by turning either to the right or left.
- Hook-handles*—The handles by which a windlass is worked.
- Horse*—The dead ground between two branches of a lode, at the point of separation.
- House of water*—A vugh or space, whether artificially excavated or not, filled with water.
- Horse-arm*—The part of a horse whim to which the horses are attached.
- H. Piece*—See *Aitch-piece*.
- Hutch*—Cistern or box.
- Irestone*—Hard clay-slate, hornblende, hornblende slate, hornstone.
- Investing*—Coating or covering another mineral.
- Jigger*—Cleaner of the ores.
- Jigging*—Separating the ore with a griddle or wire-bottomed sieve, the heavier substance passing through to the bottom or lower part of the sieve; the lighter substances remaining on the upper part are put by for halvans.
- Junction*—Applied to where veins unite.

*Jumper*—A long borer, worked by one person.

*Keeve*—A large vat.

*Kibble*—A bucket usually made of iron, in which the ore, &c. is drawn to the surface.

*Kibble filler*—Man who sends up work, &c. to the surface.

*Killas*—Clay slate.

*Lamellæ*—The thin plates of minerals.

*Lander*—Man who attends at mouth of shaft to receive the kibble in which ores, rubbish, &c. are brought to the surface.

*Lappior*—The dresser of the leavings.

*Laths*—The boards which are put behind and supported by the “durns.”

*Launders*—Tubes or gutters for the conveyance of water; their form that of a long box, wanting the upper side and both ends.

*Leader of the lode*—A branch or small vein; part of the main lode.

*Learies*—Empty places; old workings or vughs.

*Leat*—A watercourse.

*Leavings*—The ores which are left after the “crop” is taken out.

*Levels*—Galleries driven on the lode usually at ten, twenty, thirty, &c. fathoms below the adit level.

*Lifters*—Wood beams, to which the iron heads of a stamping-mill are fastened.

*Lock-piece*—A piece of timber used in supporting the workings.

*Lode*—See *Vein*. A regular vein producing or affording any kind of metal.

*Loobs*—Slime containing ore.

*Lost levels*—Levels which are not driven horizontally.

*Machine whim*—A rotary steam-engine employed for winding.

*Mallet*—An instrument used with the borer.

*Material man*—One who delivers out and has care of the materials.

*Meat earth*—The vegetable mould.

*Mock lead*—Blende; sulphuret of zinc.

*Moorstone*—Granite.

*Mundic*—Iron pyrites.

*Needle, or nail*—A long taper piece of copper or iron with a copper point used when tamping the hole for blasting, to make, by its withdrawal, an aperture for the insertion of the rush or safety fuse or train.

*Owner's account men*—Workmen paid at so much per day.

*Pack*—To occasion the speedy subsidence of the ore in the process of tossing or chimming, by beating the keeve in which it is performed by a hammer.

*Pair, or Pare*—Gang or party of men.

*Parcel*—A heap of ore dressed and ready for sale.

*Pass*—An opening left for letting down stuff to the level.

*Peach*—Chlorite.

*Pedn cairn*—A hunch of ore at a distance from the lode.

*Pick*—An instrument of common use, as well in agriculture as in mining.

*Picker, or Poker*—A hand chisel for dzhuing, which is held in one hand, and struck with a hammer.

*Pillar*—A piece of ground left to support the roof or hanging wall.

*Pitch*—Limits of the piece of ground set to tributers.

*Pitch-bag*—A bag covered with pitch, into which powder is put (previously to its being introduced into a damp hole) that it may be protected from moisture.

- Pitman*—One employed to look after the lifts of pumps and the drainage.
- Pitwork*—The pumps and other apparatus of the engine-shaft.
- Plat*—Ground taken away in the mine to contain any ores or deads.
- Plunger*—The piston or forcer of a forcing-pump.
- Plunger lift*—The set of pipes attached to a forcing-pump.
- Point of the horse*—The spot where the lode is split or divided into two or more branches.
- Pol-roz*—Pronounced polrose ; the pit underneath a water-wheel.
- Pot-grown*—Soft decomposed granite.
- Prian*—Soft white clay, esteemed a favourable sign when found in a lode.
- Pril*—A solid piece of virgin metal, or the button from an assay.
- Produce*—Fine copper contained in 100 parts of ore.
- Purser*—The cashier or paymaster at the mines.
- Quere*—A small cavity or fissure.
- Rack*—An inclined frame on which the ores and slimes are washed and separated.
- Racking*—Is a process of separating small ore from the earthy particles by means of an inclined wood frame ; the impurities being washed off, and the ore, remaining near the head of the rack taken from thence, undergoes tossing.
- Ramose*—Branchiform.
- Reed, or Spire*—Gorse, or other tubular vegetable, into which gunpowder is put to convey a train from the snoff to the charge, the reed being put into the aperture made by the needle.
- Refining*—Separating the ores.
- Relief*—When one workman of the same pair changes core, or takes the place of another.
- Riddle, or Griddle*—A sieve.
- Rising*—Digging upwards.
- Row*—Large stones.
- Rullers*—The persons who work the wheel-barrows underground.
- Run*—When excavations fall together.
- Run of a lode*—Its direction.
- Rush*—Used for the same purposes as the reed and spire.
- Scal*—A shale or portion of earth, rock, &c., which separates and falls from the main body.
- Scovan lode*—A lode having no gossan on its back or near the surface.
- Scraper*—A piece of iron used to take out the pulverized matter which remains in the hole when bored, previously to blasting.
- Seam*—A horse-load.
- Sett*—A mine or number of mines taken upon lease.
- Set of timber*—A frame complete to support each side of the vein, level, or shaft.
- Set-off*—The part of a connecting rod to which the bucket rod is attached.
- Shaft*—A sinking or pit either on the lode or through the country.
- Shaking*—Washing the ores.
- Shammel*—When ore or water is lifted part of the required height by one machine or person, and part by another.
- Shears*—Two pieces of wood placed in a vertical position, or nearly so, on each side of shaft, and united at the top, over which by means of a



pulley passes the capstan rope. This is for the convenience of lifting out or lowering into the shaft timber or other things of great length and weight.

*Shelf*—The firm rock.

*Shieve*—The pulley over which the whim rope passes.

*Shoding*—Tracing stones from the lower ground to the lode whence they were separated or torn by some convulsion of nature.

*Shooting*—Shutting or blasting; fracturing and separating by the use of gunpowder.

*Sinking*—Digging downwards.

*Skimpings*—Skimmings of the light ores, &c. in the dressing process.

*Slide*—A vein of clay which, intersecting a lode, occasions a vertical dislocation.

*Slimes*—Mud containing metallic ores; mud or earthy particles mixed with the ore.

*Smelting*—Reducing the ores by means of fire.

*Snoff, or Match*—A substance, frequently brown paper, or other slowly combustible substance, which is ignited at one end, the other being in contact with the rush or train in blasting; the slow combustion is to permit the escape of the labourers.

*Sollar*—A small platform at the end of a certain number of ladders.

*Spalling*—The breaking up into small pieces, for the sake of easily separating the ore from the rock, after which it undergoes the process of cobbing.

*Span beam*—The horizontal beam passing over the whim in which the upper pivot of the perpendicular axis moves.

*Stamps*—Machinery for crushing the ores with the presence of water.

*Stamp head*—The iron weight or head connected with the stamps.

*Standard*—The regulation of the standard depends entirely on the price which fine copper bears in the market, rising and falling in the same proportion. Supposing the produce of a parcel of ore to be 10, and the price at which it was sold to the smelter to be 8*l.* 18*s.*, the standard of that parcel will be thus obtained:—10 tons of the ore will be required to yield one ton of fine copper—therefore, 8*l.* 18*s.*  $\times$  10 = 89*l.* will be the value of the ore containing a ton of metal. The returning charge of 2*l.* 15*s.* must then be deducted, which in like manner multiplied by 10, gives 27*l.* 10*s.*; this added to the former makes 116*l.* 10*s.*, being the standard of that parcel. Low produce ore naturally brings a higher standard.

*Stannary laws*—Regulations for the management, &c. of tinnerns, administered by equity judges resident in Cornwall and Devon.

*Stem*—A day's work.

*Slope*—To *slope*, to excavate horizontally, or beat away the backs.

*Spar*—Quartz.

*Spend*—To break ground; to work away.

*Squat of ore*—See *Bunch*.

*Strake*—A launder, or box of wood without ends, in which the process of washing or tying is performed.

*Strapping plates*—The iron plates by which the connection rods are fastened to each other.

*Stream tin*—Tin ore found in the form of pebbles in vales and streams.

*Streamers*—The persons who work in search of stream tin.



*String*—A small vein.

*Stuff*—Attle or rubbish.

*Stull*—Timber placed in the backs of levels, and covered with boards or small poles to support rubbish.

*Sturt*—When a tributer takes a pitch at a high tribute, and cuts a course of ore, he sometimes gets from fifty to two or three hundred pounds in two months; these great wages are called a sturt.

*Sump*—A pit; the bottom of the engine-shaft.

*Sump-shaft*—The engine-shaft.

*Sumpmen*—The pitman's assistants; men who attend to the machinery in the engine-shaft.

*Takel or Tackle*—Windlass, rope, and kibble.

*Tamping*—The material, usually soft stone, placed on the gunpowder in blasting, in order to confine its force, which would otherwise pass up the hole; also the process of placing the material.

*Tamping iron or bar*—Tool used for beating down the earthy substance on the charge used in blasting.

*Team*—To lade water in bowls.

*Thrown*—either up or down—Is when a slide intersects a lode, the dislocation being shown by a transverse section.—*Thrown up*, is when the undiscovered portion of the intersected lode is found to have been apparently lengthened—*Thrown down*, is the reverse.

*Ticketings*—The weekly public sales of ores.

*Timber man*—The man employed in placing supports of timber in the interior of the mine.

*Tollar*—A person who periodically examines the limits of ground producing tin ore belonging to himself or (the lord) his employer.

*Ton*—The ton varies in different districts; the common ton is 20 cwt. of 112 lbs. or 2,240 lbs. In Cornwall, the mining ton is 21 cwt. of 112 lbs. or 2,352 lbs.

*Tossing, or Tozing*—A process consisting in suspending the ores by violent agitation in water, their subsidence being accelerated by packing—the lighter and worthless matter remains uppermost.

*Trade*—Attle or rubbish.

*Tram-carriage*—The carriage (usually made of iron) used on a tram-road.

*Tram-road*—Iron railroad way.

*Treloobing*—See *Tossing*.

*Tribute*—Proportion of the ore which the workman (tributer) has for his labour.

*Tributers*—Men whose pay is a certain proportion of the ore or value of the ores they raise.

*Tribute pitches*—The limited portions of a lode which are set to "a pair" of tributers, beyond which they are not for the time being permitted to work.

*Tunnel head*—The top of a furnace, at which the materials are put in.

*Turned house*—A term used when a level, in following branches of ore, is turned out of the original direction.

*Trunk*—A long narrow cistern or pit, in which the ore and slimes which are mixed are separated by the subsidence of the former, and the washing off the impurities—the inclined box in which the ore and slimy impurities are separated in the process of trunking.

- Trunking*—Process of extracting ores from the slimes—subsequently the ores undergo the processes of racking and tossing.
- Tummals*—A great quantity; a heap.
- Tut work*—Work in which the labourer earns in proportion to the amount of his labour; being paid for driving at a certain price per fathom.
- Tuyere*—The aperture through which the air or blast is introduced into the furnace.
- Tying*—Washing.
- Underlayer*—A perpendicular shaft, sunk to cut the lode at any required depth.
- Underlay-shaft*—Shaft sunk on the course of the lode.
- Van*—To wash and cleanse a small portion of ore on a shovel.
- Vein*—See *Lode*.
- Vugh, or Vogle*—A cavity.
- Washing*—The ore undergoes occasionally two or three washings; the first process being that of washing the slimes and earthy particles from the rougher and larger stones of ore.
- Water in fork*—When all the water is extracted.
- Well*—The lower part of a furnace, into which the metal falls.
- Wey*—A term used in South Wales, as applied to collieries, signifying ten tons.
- Whim*—A machine worked by horse, steam, or water, for raising ores, &c.
- Whim driver*—Man who attends to the horse in the whim.
- Whim rope or chain*—The rope or chain by which the kibble is attached to the winding engine or whim.
- Whim shaft*—The shaft by which the stuff is drawn out of the mine by horse or steam whim.
- Whip and derry*—A kibble drawn to the surface by a horse, the rope attaching one to the other simply passing over a pulley.
- Willd*—See *Blende*.
- Winch, or Winze*—Contraction of windlass; the wheel and axle frequently used for drawing water, &c. in a kibble by a rope.
- Windbore*—The lowest pump in which there are holes to admit water.
- Winding engine*—One used to draw up ore, attle, &c.
- Winze*—A sinking on the lode communicating one level with another, for proving the lode or for ventilating the drivings.
- Work*—Ores before they are cleansed or dressed.
- Working barrel*—The pump in which a piston works.
- Working big*—Sufficiently large for a man to work in.
- Zawn*—A cavern.
- Zighyr*—When a small slow stream of water issues through a cranny it is said to zighyr or sigger.—(*Pryce*.)

## DERBYSHIRE.

- Adit*—An horizontal level taken up at the foot of a hill, and either driven on the lode or to intersect it, for unwatering or draining the mine at that level, and also occasionally used for bringing out the ores. The top adit is the adit first driven, deep adit the lowest adit driven; air adit is the adit driven purposely for ventilating the mine.

- Arched*—The roads in a mine when built with stones or bricks are generally arched ; level drifts and horse roads, either when cut in coal or in other strata, are formed arch fashion in the cutting for better security.
- Bank, or Benk*—The face of the (coal) works or place where the miners are turning out the coal, sometimes called benk face.
- Bar master*—An officer who superintends the lead-mines.
- Bar mote*—A hall or court in which trials relative to lead-mines are held.
- Bassit*—The outcrop of the strata : when a substance, as coal, appears at the surface, it is said to be bassit ; also sometimes used to signify the upper end of the works, as the bassit or upper end.
- Bearer, or Biard*—A large piece of timber to support the cistern and pumps in an engine-shaft.
- Balland*—Dusty lead ore.
- Belt*—A strap to which is attached a chain by which coal-miners draw the loaded corves of coal.
- Bender*—A piece of iron attached to trunks, or barrels, to which the pit rope is affixed.
- Bina*—Indurate clay ; a name given by miners to any indurate argillaceous substance.
- Binghole*—A hole through which the ore is thrown.
- Bingplace*—The place where the ore is laid ready for smelting and measuring.
- Boring bit*—A piece of steel placed at the end of the borer.
- Blast*—The air introduced into a furnace.
- Blasting*—A hole made with a borer in which gunpowder is introduced, which being confined, and set fire to by a match, forces off a portion of the rock or lode—the process is called blasting.
- Board, or Board gate*—An adit is driven board when it runs in a transverse direction to the grain or face of the coal.
- Borer, Auger, or Drill*—A round piece of iron, the one end steeled.
- Bow*—See *Bender*.
- Bowse*—Lead ore as cut from the vein.
- Breast*—The face of the (coal) workings.
- Brettis (in coal mines)*—A quantity of wood packed together, and the interstices filled up with slack or rubbish.
- Brettis way (ditto)*—A way or road in the mine supported by brettises, built up on each side after the coal has been wrought out.
- Bucker*—A flat piece of iron with a wooden handle used for breaking or crushing the ore by hand.
- Bucklers, or Tacklers*—Small chains put round the coals, when loaded in corves, to prevent them from falling off.
- Buddle*—A frame made of wood and filled with water, in which the lead ore is washed.
- Budling*—Washing inferior ore lead to free it from extraneous matter.
- Bule*—A piece of wrought iron to put round buckets or clack doors on large pumps, to hold them in their respective places.
- Bunding*—Wood placed on which the refuse cuttings or deads are thrown.
- Butty*—In collieries a person who contracts to raise coal by weight or measure.
- Cank*—Whimstone.



- Cap, or Lid**—A flat piece of wood placed between the top of the punch and the roof of the mine.
- Cat dirt**—A substance also called toadstone, being sometimes clay, coal, and pyrites of iron ; at others, a kind of earthy scoria not unlike lava.
- Chair**—Used in drawing up ore or coal.
- Chisel**—See *Drill*.
- Churndrill**—A large drill from four to six feet long, commonly made with a chisel point at each end.
- Cleet**—A wedge.
- Clivis**—A hook with a spring to prevent its unfastening.
- Coesteads**—A small building.
- Cofer**—Cofering is beating a quantity of clay round the bricking in shaft to prevent the water coming through, and to hold it back in the strata.
- Colliery bailiff**—Superintendent of the colliery.
- Cope**—To agree to get lead ore at a fixed sum per dish or load, or other measure.
- Coper**—One who agrees to get lead ore by bargain.
- Corf**—A square frame of wood to load coals on ; a kind of sledge used to carry ore from the miners at work to the shaft bottom.
- Creep**—The weight of the incumbent strata after the coal has been partially worked out.
- Crib, or Curb**—A circular frame of wood, either pinned or screwed together, to serve as a foundation for the bricking in a shaft.
- Cross-cuts**—Lodes or levels driven in a diametrical direction, across the range of the vein.
- Crow-bar**—A lever from six to eight feet long.
- Cupelo**—A small furnace, worked by blast.
- Curb**—See *Crib*.
- Cutting**—An air-course set up at either end of the work after the coal has been wrought out.
- Crosses and holes**—When a person discovers a vein, and has no means to possess it for want of stowces, he marks the ground with crosses and holes, by which means he possesses it until he can procure stowces.
- Dam**—Dams are made for various purposes underground, either for holding back water or noxious vapours, such as choke or fire damp. They are generally built either with sand or clay.
- Dan**—A square frame of wood to draw coals from the work to the main roads underground.
- Deads**—Cutting of stone of no use, attle or rubbish.
- Deep level**—The watercourse leading to the engine-shaft, being always the deepest adit in the mine.
- Dial**—A compass used to take bearings in mines.
- Dialling**—Taking the different bearings of the various ways, gates, &c. in a mine ; surveying.
- Dish**—A measure containing fifteen pints Winchester measure.
- Door in a mine**—Is sometimes used to open and shut, to increase the circulation of air.
- Dresser**—See *Loading pick*.
- Drift**—The excavation made for a road underground.
- Drill**—An instrument for boring shot and other holes.
- Driving**—Cutting and blasting horizontally, applied to making a level or adit.



- End*—An adit is said to be driven end when it is in a line with the grain of the coal.
- Ending*—An adit driven in a direction with the grain of the coal.
- Elve*—The shaft or handle of a pick.
- Face*—The face of the coal is at right angles with the grain.
- Fang*—A niche cut in the side of an adit or shaft to serve as an air-course; sometimes a main of wood pipes is denominated a fanging.
- Fausted*—Refuse lead ore requiring to be dressed finer.
- Fault*—An intersection of the strata.
- Feigh*—The refuse washed from the lead ore.
- Flat*—Flat work, &c., when a vein, &c. is horizontal.
- Forks*—Pieces of wood used to keep the side up in soft places.
- Foundermere*—The first thirty-two yards of ground worked.
- Foundershaft*—The first shaft that is sunk.
- Forefield*—The face or extent of the workings.
- Forefield end*—The farthest extremity of the workings.
- Freeing*—Entering a mine or vein in the barmaster's book.
- Fuzze*—Straws or hollow briars, reeds, &c., filled with powder.
- Gallery*—A drift or level.
- Gate*—Road or way underground; it has various uses, either for air, water, or for bringing out the mine, coal, &c.
- Gin*—The machine by which the coal or ore is raised from the mine.
- Gobbing*—The rubbish remaining after the coal has been extracted.
- Grove*—A mine.
- Gingoni*—Walling up a shaft, instead of timbering, to keep the loose earth from falling.
- Hade*—The underlay or inclination of the vein.
- Hadings*—When some parts of the vein incline and others are perpendicular.
- Hangbench*—Part of the stowces.
- Hanging-side*—The wall or side over the vein, or to which it hangs.
- Horn*—A line running horn is at an angle of 45 deg. with the face of the coal.
- Jackhead-pit*—A well sunk inside the mine for various purposes.
- Jackhead-pump*—The house water-pump of an engine is sometimes so called.
- Jig-pin*—A pin used to stop the machine in drawing when necessary.
- Judge*—A staff to measure underground work with—viz., the holing in coal-work.
- Jumper*—A large borer, an iron instrument worked by hand, and steeled at each end like chisel bits.
- Keil*—A sparry substance found in the vein composed of calcareous spar, fluor, and barytes.
- Kibble*—A bucket used for drawing up lead ore out of the mine.
- Kit*—A wood vessel of any size.
- Knits*—Small particles of lead ore.
- Knockings*—Lead ore with spar as cut from the vein.
- Knockstone*—A stone used to break the lead ore on, but sometimes it is a piece of cast-iron.
- Leap*—The vein is said to leap when a substance intersects it, and it is found again a few feet from the perpendicular.
- Leadings*—Small sparry veins in the rock.

- Level*—An adit, gallery, or sough; generally the main watercourse in a mine.
- Lid*—See *Cap*.
- Limp*—An iron plate used to strike the refuse from the sieve, in washing lead ore.
- Loading-pick*—A pick made purposely to cleave or rive up coals, and prepare them for laying on the corves.
- Loch*—A cavity in a vein.
- Lot*—A certain proportion taken as dues for the lord of the manor, or owner of the mine.
- Maul*—A large hammer.
- Maundrill*—A pick for various purposes, but generally used to undermine.
- Mear*—Thirty-two yards of ground on the vein.
- Needle, or Pricker*—A thin rod of iron put in shot-holes, while they are rammed up, and which being then drawn out leaves a hole into which the match is introduced for setting fire to the charge.
- Noger*—A jumper or borer; a drill.
- Nogs*—Square pieces of wood which are piled on each other to support the roof of a coal-mine.
- Noper*—See *Loading-pick*.
- Old man*—Places worked centuries ago, or in former ages.
- O'erlayer*—A piece of wood on which the sieve is placed after washing the ore in a vat.
- Opens*—Large caverns.
- Open cast*—When a vein is worked open from the *day* or surface.
- Ore*—The mineral as produced in a mine.
- Pack*—A quantity of materials, either wood or coals, &c. piled up to support the roof, or for other purposes.
- Pee*—A piece of lead ore.
- Pillar*—A support for the roof, of timber, stone, or other material.
- Pipe*—A vein running unlike a rake, having a rock roof and sole.
- Plumb*—A line and lead to measure with.
- Poling*—A plank or piece of wood to prevent earth or stone from falling.
- Possession*—When stowces or wooden frames are placed on a vein, it is said to be in possession.
- Post*—A pillar of coal or other strata left.
- Pricker*—A thin piece of iron used to make a hole for the fuze or match to fire a blast.
- Pringap*—A variable distance between two possessions.
- Punch*—A piece of timber used as a support for the roof.
- Rake*—An oblique vein.
- Ratchell*—Loose stones.
- Rib*—A pillar of coal left as a support for the roof.
- Ricket*—See *Fang*.
- Rider*—A rocky substance which divides the vein.
- Ringer*—A crowbar.
- Rising*—A man working above his head in the roof is said to be rising.
- Roof*—The part above the miner's head; that part of the strata lying immediately upon the coal.
- Rubble*—See *Ratchell*.

- Run*—When the earth falls and fills up the shafts or works, it is said to run.
- Safety fuze*—An excellent invention, by Messrs. Bickford, Smith, and Davey, of Camborne, for the safe and certain blasting of rocks in mines and quarries.
- Scaffold*—In a mine, a platform made, where some miners work above the heads of others.
- Scouring bit*—A bit attached to the end of boring-rods for the purpose of extracting the rubbish.
- Scraper*—An instrument to extract the pulverized rock, &c. from shot-holes when boring.
- Scrin*—A small vein.
- Seat, or Sole*—The floor or bottom of the mine.
- Shaft*—A pit, the perpendicular entrance to the mine.
- Shakes*—Fissures in the earth.
- Shift*—The time a miner works for one day.
- Shot*—Blasting.
- Sinking*—Working deeper or downwards.
- Skep, or Skip*—A square box (usually wrought iron) in which the coals are sent up to the pit's mouth.
- Sled*—A sledge to draw ore without wheels.
- Slides*—Flat pieces of iron for the corves to slide on.
- Slit*—A communication between two adits.
- Smelting*—Reducing the ore to metal.
- Smitham*—Small lead-ore dust.
- Smut*—Decomposed dark earthy substance, or coal decomposed by the air at the surface of the earth.
- Sole*—The seat or bottom of the mine, applied to horizontal veins or beds.
- Sole-tree*—A piece of wood belonging to stowces to draw ore up from the mine.
- Sough*—An adit or level for carrying off the water.
- Spanner*—An instrument to turn screws with.
- Spindle*—A part of the drawing stowces.
- Stays*—Pieces of wood to secure the pumps in the engine-shaft.
- Stemmer*—A piece of iron with which clay is rammed into the shot-holes to make them water-tight.
- Stemples*—Wood placed to go up and down the mine instead of steps.
- Stickings*—Narrow veins of ore.
- Stope*—A piece of mineral ground to be worked.
- Stoping*—Cutting mineral ground with a pick; working downwards.
- Stopping*—A dam of bricks or clay to turn the course of the air.
- Stowce*—Drawing stowce; a small windlass.
- Strings*—Small veins of ore.
- Stowces*—Pieces of wood of particular forms and constructions placed together, by which the possession of mines is marked; a pair of stowces possess a mear of ground.
- Sump*—A shaft underground, a well or lodge for water.
- Swallows*—Caverns or openings where the water loses itself.
- Tacklers*—Small chains to put round the loaded corves.
- Thurl*—A long adit in a coal-pit.
- Thurst*—The ruin of the incumbent strata after the pillars and stalls are wrought out.

*Trogues*—Wooden drains like troughs.

*Troubles*—Faults or interruptions in the stratum.

*Trunks*—Wooden spouts to convey wind or water ; small boxes in which rubbish or dirt is sent up out of the mine.

*Tub*—A cast-iron cylinder put in the shaft instead of bricking, for the purpose of beating out the water and making it rise to a level.

*Tugs*—Hoops of iron fastened on the corves to which the tacklers are affixed.

*Turntree*—A part of the drawing stowces or windlass.

*Underlay*—When a vein hides or inclines from a perpendicular line, it is said to underlay.

*Vein*—Any substance different from the rock ; a rake vein is oblique ; a pipe vein nearly horizontal.

*Vat*—A wooden tub used to wash ore and mineral substances in.

*Wash-hole*—Where the refuse is thrown.

*Walling*—When the roads in the mine are made with stone, it is called walling. The side of the mine or gangart is frequently called the wall.

*Wastes*—Vacant places left in the gobbing, on each side of which the rubbish is packed up for the better support of the roof.

*Water-holes*—Places where the water stands.

*Weigh-board*—Clay intersecting the vein.

*Wedge*—An iron tool to get ore, split rocks, &c.

*Whim*—An engine or machine to draw ore, &c., worked by horses.

*Wind-way*—A passage left purposely for air.

*Wind-bore*—The bottom pipe in a lift of pumps.

*Wind-holes*—Shafts or sumps sunk to convey wind or air.

*Windlass*—A machine used to draw up ore, &c.—See *Stowce*, by which name it is commonly called.

*Windless*—A place in a mine where the air is bad or short is said to be windless or airless.

*Yokings*—Pieces of wood ascertaining possession ; stowces.

## SOUTH STAFFORDSHIRE.

*Air-head*—A channel 2 feet 3 inches by 3 feet 6 inches, driven on a level with the top of the gate-road, and about 4 yards on one side of such gate-road.

*Bildas, or buildhouse*—The men going down at 6 and working till 9, and sometimes 10 o'clock, is termed a bildas, for which the men get nothing but a drop of beer. This was originally denominated *build-house*, from the fact of the butty being able to *build* so many *houses* from the exactions thus made upon the poor men.

*Boring apparatus*—Consisting of triangles, springing-pole, rods, punches, shell, &c.

*Blowing-tools*—A small set of blasting instruments.

*Breakes*—Fissures, or cracks, that are found in working near old works, arising from the consolidation of such old workings.

*Back-horse*—The horse that draws the loading skip from the loaders to the waggon-hole.

*Bolt-hole*—A passage same size as gate-road, but leading from the gate-road into a side of work, in which the dams are generally placed.

*Bandsman*—A man who loads up the coal.



- Banksman*—A man who lands the skip at surface.
- Bow*—A piece of wrought iron passing from one side to the other of a skip, by which it is let down into the mine.
- Bating*—Lowering the gate-road, or other passage.
- Benching-up*—Holing above the measure, and then breaking up the lower part.
- Bowke*—A small wooden box, used for drawing clay and ironstone, and for sinking.
- Butty*—A getter of coals, or ironstone, by contract by the ton.
- Curb*—A circular piece of wood, pinned together as a foundation for the bricking of a shaft.
- Crop*—The line of inclination of a mine.
- Calcining*—Roasting iron ore.
- Charter-master*—See *Butty*.
- Cutting*—The coal being cut perpendicularly round the pillars and ribs, in order to let the coals fall.
- Cog*—A small square building of rough stones, or coals, left to support the roof during the operation of holing.
- Crowbar*—Wrought-iron levers of various lengths, for rifting out the large coals.
- Capstan and Rope*—Winding apparatus, with levers and strong rope, used when repairing pumps, trees, &c.
- Cleansing*—Clearing and making fit for traversing old gate-roads; carrying out slack from the holers; clearing the sumps at bottom of shafts; to admit of water-room, &c.
- Cropping-out*—When the seam crops out at surface.
- Doggy*—An underground superintendent, employed by the butty.
- Downfall*—A downthrow.
- Dialling*—Surveying the different ramifications of the mines by means of the magnetic needle.
- Dresser*—A large pick, used for preparing the large coals for loading into the skips.
- Driving*—Cutting and blasting horizontally, applied to making a level, or air-way, &c.
- Dip*—The line of depression of a mine.
- Dan*—A small waggon, used in ironstone-mines.
- Damp*—Carbonic acid gas.
- Dog-hook*—A long hook, by which the empty skip is drawn in any direction.
- Damp sheet*—A large coarse sheet, placed across the gate-road, to force air in another direction.
- Doors*—Stoppings for air in main gate-road.
- Draught*—The quantity of coals raised to bank in a given time.
- Drink-time*—Meal-time.
- Drum*—That part of the winding machinery on which the rope or chain is coiled.
- Drop*—Applies to a quantity of coal caused to drop by cutting—sometimes the thickness of 3 feet, and at others of 6 feet.
- Druggon*—A square wrought-iron or wooden box, used for lowering clear water into the mine for the horses, and for conveying water into the interior of the mine, &c.
- Dams*—Stoppings of fine sand and brickwork, of various thicknesses, in

the gate-roads, to exclude the atmospheric air from old workings, to prevent spontaneous combustion.

*Engine-pit*—The pumping-shaft.

*Elve*—The handle of a pick.

*Fault*—A dislocation, with rock, or other foreign matter, lying between.

*Fire-stink*—Arises from the decomposition of iron pyrites, which is so abundant; hence the necessity of ribs, dams, &c.

*Fast-end*—The part of a face that juts against the solid.

*Foot-hook*—The large hook that is hooked to the bow of a skip, or tacklers, in drawing coals up the shaft.

*Foot-hook chain*—A strong chain at the end of the rope, and connected with the foot-hook.

*Face*—In ironstone-mines, the work in progress.

*Fleaing*—Is practised when a gate-road, or other work, is about to be abandoned, as a system of robbing, as it is termed in the north, or an endeavour to thin the ribs to the greatest extent.

*Fighting*—Applies to the ventilation when reversed—as the upcast becoming the downcast, and *vice versâ*.

*Ground Bailiff*—A superintendent, visiting the mines about once a week; has the entire direction, and should be made answerable for all accidents from breakages, bad ventilation, &c.

*Gin*—A wooden drum, with vertical shaft, cross-piece, beam, &c., by means of which shallow mines are realized.

*Gate-road*—A passage driven on the floor of the coals about 10 feet wide, and 10 feet high, used to carry the coals along.

*Gob*—The refuse that is left behind when the work is completed, as small coal, earthy matter, inferior ironstone, &c.

*Gob-road*—A road that passes through that part of the mine which has been previously worked.

*Garland*—A trough, or gutter, round the inside of the shaft, to catch the water running down the sides.

*Holing*—The lower part of the coal being taken away, 2 feet 3 inches in height, honourably, in order to bring down the overlying mass.

*Hanger-on*—The man who hangs the skip on at the bottom of the shaft.

*Horse-fettler*—The man whose whole duty it is to provide for and attend to the horses underground.

*Hanging*—Applies to that part of the seam which remains—as when the bottom coal is taken away, the top coal is hanging.

*Hammer*—Large 8 or 10 lb. hammers, used for driving the wedges in breaking up large coals for loading.

*Horns*—Guides for the rope on the drum.

*Hand-gears*—Small winding hand-barrel, used for preliminary sinking, or to realize very shallow mines.

*Holing-shovel*—A short-handled, round-bladed shovel.

*Hovel*—An erection at surface, near the pit's mouth, for the convenience of the banksman.

*Jackey-pit*—A small shaft sunk inside the mine, for various purposes.

*Jig-chain*—A chain hooked to the back of a skip, and running round a post, to prevent its too rapid descent on an inclined plain.

*Knocking-up*—The banksman beating (rather peculiarly) the runner at surface, to inform the miners below that it is time to come up.

*Knob*—A small support for the roof.

- Lazyback*—The place at surface where the coals are loaded and stacked for sale.
- Lid*—A piece of wood placed between the top of a prop of timber and the roof of the mine.
- Level*—A water-passage underground.
- Log, or Baby*—A balance weight, placed near the end of the pit-rope, to prevent its running back over the pulley.
- Landing*—The banksman receiving the loaded skip at surface.
- Ladder*—Strong wood ladders, 10 to 20 feet long, to enable the collier to affix his scaffolding, when cutting the top coals in.
- Lever*—Strong oak levers, 15 feet long, used to lift loaded skips on to the rails, in case of their getting off, or accident, &c.
- Lamp*—The safety-lamps of Davy, Clanny, Stephenson, and Upton and Roberts. The majority are made by local ironmongers.
- Launder*—A large wrought-iron or wooden spout, into which the water-barrel is lowered, and which conveys the water to a culvert, or other outlet, near the pit's mouth.
- Mobby*—A leathern girdle with small chain and hook, used by lads in drawing the ironstone from low places, on small bowkes.
- Mine Surveyor*—A person who dials the workings of a colliery as often as requisite, and makes plans of the mines got and ungot.
- Machine*—The weighing apparatus used to weigh the coals at surface.
- Man-o'-war*—A small pillar left in some critical situation in a side of work.
- Navy*—That part of the face of an ironstone-mine lying between two roads.
- Net*—A strong cord net by which the large and powerful horses are let into the collieries.
- Openings*—Those parts of the side of a work that are between the pillars and between the pillars and ribs.
- Open Work*—A coal quarry.
- Pricker and Puller*—A long sharp-pointed instrument (not unlike a boatman's shaft), used to break out the spurns left in cutting the coals.
- Pillar*—A square piece of coal, 9 yards square, left to support the roof, but which in completing the side of work is often robbed—viz., parts cut away.
- Parting*—A small joint in the coal-measure; and when one road leads out of another, that is a parting also.
- Pikeman*—A man who holes or cuts the coal.
- Pit-frame*—The framework carrying the pit pulley.
- Pit-eye-pillar*—A solid piece of coal, left round the bottom of shafts for their protection.
- Ring*—A circular piece of wrought-iron, about 8 inches deep, used to place on the skip of coals, to increase the load.
- Rise*—An upthrow.
- Royalty*—The dues payable to the real owner of the colliery.
- Rib*—A barrier of coal, left between each successive side of work, to prevent either water or obnoxious vapours, arising from such old workings, spreading over the whole pit.
- Runner*—Landing-waggon for the skip at surface.
- Roofing*—When the top of the loaded skip wedges against the top of the gate-road.



- Rake*—A strong iron rake, for loading up into iron baskets the small coals.
- Runner*—Applies when any part of the winding-machinery breaks, and allows the loading skip or miners to descend the shaft with the greatest velocity.
- Rate*—The sides of the gate-road, or other works, falling off and obstructing the passage.
- Rodney*—A roughly-constructed platform, with old rails, near the pit's mouth, upon which a large fire is made during the winter nights, to light the bank.
- Stint*—A given quantity of work to be performed.
- Side-bassett*—A transverse direction, or at right angles with the line of dip.
- Sleepers*—Are of wood or cast and wrought iron, according to their different purposes.
- Setting*—Timber setting, or props, in various lengths.
- Sump*—Water-room at the bottom of a shaft.
- Sump-planks*—Strong balks of timber bolted together, forming a temporary bottom, or scaffolding, for the shaft.
- Side-laning*—Making the gate-road (when abandoned for that purpose) into an opening 10 yards wide—viz., making the gate-road part of the new side of work.
- Snatch*—A small chimney at surface, about 6 or 8 feet high, connected with an air-furnace and trumpeting, used to ventilate very limited underground workings by the means of one shaft, but much disused now.
- Stall*—An opening made between pillars in the direction that the work is progressing, and the transverse openings—also termed *openings*.
- Straight-stall*—An excavation made into the thick coal, having the solid coal left on three sides of it.
- Scaffold*—Planking elevated by stays and ladders, in order to allow the miner to ascend and disengage the coal in the upper part of the seam.
- Shaft*—A pit from 5 to 8 feet diameter, the smaller used for ironstone and the larger for coal mines.
- Shift*—The extent of time taken for any particular operation.
- Slipes*—The sledges at the bottom of the skip, used to draw the coals upon from the work in progress to the railroad.
- Smut, or Mucks*—Bad soft coal, containing much earthy matter, found in the immediate locality of faults.
- Stays*—Pieces of wood to secure the pump-trees in the engine-pit.
- Stamp*—A mark cut in the roof or sides of the mine, as a point of reference, to show the amount of work done.
- Spurns*—Small ties or connections, left between the coals hanging and the ribs and pillars, to insure safety to the miner during the operation of cutting.
- Sulphur*—Carburetted hydrogen gas.
- Stage*—A particular distance that a horse travels along the gate-road, and where candles are regularly placed.
- Shot*—Blasting.
- Skip*—A sledge-shaped waggon with a wrought-iron bow, used to draw the coals up the shaft.
- Straw*—A fine straw filled with powder, used as a fuse.



*Stone*—Ironstone.

*Side of Work*—An excavation in the 10-yard coal, varying in extent, composed of a series of 10-yard square openings, and 9-yard square pillars, according to the nature of the overlying strata.

*Spout*—A channel same size as air-head, and about 4 yards long, driven from the air-head into the gate-road at about every 15 yards, so as to always keep the communication as forward as possible.

*Sumping*—A small square shaft, generally made in the air-headings, when crossing faults, &c., or made to prove the thickness of coal, &c.

*Shet*—The roof of the coal-mine when broken down.

*Trade*—Demand for coal.

*Trumpeting*—A small channel cut behind the brickwork of the shaft.

*Throwing*—Is generally done in the night, by breaking out the small spurns left at certain distances during the cutting, and so entirely disengage the hanging coal from the ribs and pillars—having nothing left then but its own cohesion.

*Tipe*—To upset, or overthrow a skip.

*Turn-out*—A short loop line of railway, made in order to allow one skip to pass the other in the gate-road.

*Tie*—A support for the roof attached to the rib, forming the shape of the letter.

*Trow*—A wooden spout, made in various lengths, and from 4 inches to 2 feet square, used for carrying air, &c.

*Tacklers*—Four pieces of chain, terminating at one end with a hook, and at the other in a ring, used to tackle up the skip with when drawing it up to the shaft.

*Thurl*—To make a breach into former workings or gate-roads.

*Tubbing*—Cast-iron cylinders, in pieces, bolted together and placed in the shaft, to enable the sinkers to penetrate quicksand, water, &c. in safety.

*Ventilating-flue*—Trumpeting, commonly called, but to which a new name has been recently given.

*Ventilating-stack*—A stack 90 feet high, with partition, and large air-furnaces, and connected with the ventilating-flue—not much used at present.

*Waggon-hole*—That part of the railroad ending in the side of work.

*Wedge*—Used to break up large coals, rock, &c.

*Whimsey*—An engine used to draw up coals; applied more to the old atmospheric engines.

*Way-end*—Applied in ironstone-mines to that part of the face where the road enters.

*Wind-way*—An air-way leading from one road to another.

*Water-barrel*—A large wrought-iron barrel, with a self-acting valve in the bottom, used in drawing water, where there are no pumps.

*Waggon*—A square platform, with four wheels placed under, for the purpose of conveying the skip of coals from the workmen to the bottom of the shaft.

*Yard-stick*—A three-feet measure, to determine the extent of holing done, &c.

## NEWCASTLE-ON-TYNE.

- Air-boxes*—Tubes of wood used for ventilation where there is only one passage or opening.
- Air-crossing*—An arch built over a horseway or other road, with a passage or air-way above it.
- Arrage*—A sharp point or corner.
- Back*—A slippery division in the coal-seam, extending from the thill to the roof.
- Back-end*—The part of a judd left after the sump is brought down.
- Back-skin*—A covering of leather worn by men working in pumping pits, or other wet places.
- Backing-deals*—Deals placed behind cribs to keep back loose strata.
- Bank*—The surface, or top of the pit.
- Bankman*—The man who lands the coals at the top of the pit.
- Bargain*—A piece of work to be done at a certain price.
- Bargain-men*—Men who work by the bargain.
- Barrier*—A strong pillar of coal left between two collieries, or between two districts of workings.
- Barrow-way*—An old term for tramway, originating from the time when the coals were brought out from the workings in barrows.
- Barrowmen*—See *Putters*.
- Basset*—The outcrop of the coal.
- Battery*—An embankment.
- Bend away*—A signal given to raise up.
- Beater*—An instrument for beating stemming on a charge of powder.
- Bed*—The foundation of a wall or cribbing.
- Blower*—An excessive discharge of gas generally from a fissure.
- Bord*—A passage driven across the fibres, or grain of the coal.
- Borehole*—A hole bored through strata to prove their quality.
- Bore-rods*—Rods used in boring.
- Bord-room*—The width across an old bord.
- Brattice*—A wood partition, used for ventilation, when there is only one opening or passage.
- Brasses*—Lumps of sulphate of iron found in coal.
- Brakeman*—The man in charge of the winding engine.
- Broken*—A part of the mine where the pillars are in course of removal.
- Boll*—A measure containing 9,676 cubic inches.
- Bucket*—The piston of a lifting set of pumps.
- Buntons*—Strong balks of timber.
- Balks*—Where the roof is not level, but comes down into the coal.
- Caller*—A man who calls the men when time to go to work.
- Calling course*—The time when the men go to work.
- Cage*—The shaft carriage.
- Canch*—A protuberance, or certain thickness of stone to be worked opencast.
- Chaldron*—53 cwt. The waggons which convey the coals from the pit to the place of shipment carry the above quantity, and are called chaldron waggons.
- Chock*—A piece of wood for stopping waggons on the top of a bank.
- Chock and Block*—Tightly filled up.
- Chisel*—The cutting part of a drill.

- Clam*—A support or bracket.
- Claggy*—Adhesive.
- Claggy top*—When the coal adheres to the roof.
- Clack*—A valve in the pumps.
- Cod*—The bearing of an axle.
- Coursing the air*—Ventilating the workings of the mine.
- Corf*—A basket for carrying coals.
- Corfbow*—The handle of the corf.
- Corver*—The man who makes and repairs the corves.
- Crampet*—A bracket.
- Creep*—A heaving-up of the floor of the mine, occasioned by the weight of the superincumbent strata.
- Crosscut*—A passage driven at an angle with the fibres of the coal.
- Crab*—A capstan, for raising or lowering of pumps, &c., in a pumping-pit.
- Consideration*—Money paid to the hewers for bad coal, or for any extra trouble.
- Cow*—A piece of wood or iron placed behind the crab or gin-start, to prevent it from revolving back.
- Coal-pipes*—Very thin irregular layers of coal.
- Cradle*—A suspended scaffold used in shafts.
- Collarings*—Pieces of wood or iron for securing the pumps in the shaft.
- Crib*—A circular piece of wood wedged tight in a shaft, to make a foundation for walling or tubbing when the strata are loose.
- Cowp*—To overturn—when the men exchange working-places they are said to “cowp.”
- Dant*—Soft inferior coal.
- Dayhole*—An adit or level from the surface.
- Daywater*—Water which penetrates into the mine through some direct opening to the surface.
- Davy lamp*—The safety-lamp invented by Sir H. Davy.
- Davy man*—The man who trims and repairs the Davy lamps.
- Deputy overman*—The man who lays the plates and sets the timber for the hewers, and has charge of a district of the mine.
- Dip*—A downward inclination.
- Downcast-pit*—The pit down which the air passes.
- Double working*—When more than one man is put to work in any one working-place.
- Double-handed gear*—Heavy drilling-tools which require two men to use them.
- Dogs*—Pieces of wood at the bottom of an air-door—the part of the chain which is fastened to the rope.
- Drill*—An instrument for perforating a hole in the strata, into which a charge of powder is laid.
- Drilling-hammer*—A hammer used for drilling holes.
- Drop*—Machinery used in shipping the coals by which the coal-waggons are lowered on to the ship's deck.
- Dyke*—A dislocation of the strata.
- Erles*—Earnest-money.
- Enginewright*—The man who repairs the engines and machinery.
- Face*—The extremity of the workings.
- Falls*—Bucket or clack falls—the part which opens and shuts to allow the passage of water.

- Fast shot*—When a charge of powder is exploded without having the desired effect.
- Feeder*—A stream or spring.
- Filleting*—Wood stringing.
- Fitter*—The person who sells the coals at the shipping port.
- Fitting-office*—The office for transacting business at the shipping port.
- Fittage*—Expenses incurred in selling the coals.
- Flat*—The termination of the horseway, the coals being brought thereto by the putters.
- Flap-door*—A manhole-door.
- Flange*—A projection at the top and bottom of pumps when they are bolted together.
- Flange bolts*—Bolts for fastening pumps together.
- Foal*—A young boy employed in putting coals.
- Foul*—When the air of the mine is explosive.
- Foulness*—The sulphuretted hydrogen gas of the mine.
- Fother*—One-third of a chaldron.
- Frame-dam*—A strong separation of wood and clay to stop water back.
- Furnace*—A large fire at the bottom of the upcast pit, to rarefy the ascending column of air.
- Furnace-man*—The man who looks after the furnace.
- Furtherance*—Extra price paid to the hewers, when required to put the coals.
- Gait*—A journey, or trip.
- Gangway*—A wooden bridge.
- Gavelock*—A lever used in working stone.
- Gear*—Working-tools.
- Gears*—The trapping of a horse.
- Girdle*—A thin stratum of stone.
- Gin*—A horse-machine, for raising men and materials up the pit.
- Glut*—A piece of wood to fill up behind cribbing or tubbing.
- Goafe*—A part of the mine from which all the coal has been worked.
- Gullet*—An opening or fissure in the strata.
- Hack*—A large pick, used in working stone.
- Half-marrow*—Young boys, of whom it requires two to do the work of one putter.
- Headsman*—A putter.
- Headtree*—A piece of wood, on the top of a prop, to support the roof.
- Helper-up*—A boy who assists the putters, when they have to bring the coals up a dip or bank.
- Headway*—A passage driven in the direction of the fibres of the coal.
- Hewer*—A man who cuts or works the coal.
- Hewing*—Working the coal.
- Heap*—The accumulation of stones, rubbish, &c. at the top of a pit.
- Heapkeeper*—A man who overlooks the cleaning of the coals on the surface.
- Hitch*—A small dislocation of the strata, which does not exceed the height of the coal-seam.
- Hoggers*—Stockings without feet, worn by the men when at work.
- Hogger-pump*—The uppermost pump in a sinking-pit.
- Horseback*—A portion of the roof or floor which obtrudes into the coal.
- Inbye*—*Inbyeside*—Further into the mine.



- "Into the house"*—The upstroke of a pumping-engine.
- Judd*—In whole-working, is a portion of the coal excavated, ready to be brought down.—In pillar-working, is a portion of a pillar of coal in the course of removal.
- Jenkin*—A lift, or passage driven in a pillar of coals.
- Jack-head staple*—A small pit in which the feed set for the boilers is generally placed.
- Jack-head set*—The set of pumps in the jack-head staple.
- Jack-roll*—A windlass worked by hand.
- Jackanapes*—Small rollers between the rope-rolls and pulleys on which the rope runs.
- Kavels*—Lots cast by the men at stated periods for the different working-places.
- Kirving*—The holing made in the bottom of the coal by the hewer.
- Keel*—A large river-boat for carrying coals—8 chaldrons.
- Keeker*—An overlooker.
- Kibble*—A small rubbish-tub.
- Laid out*—When a corf or tub contains an excess of small coal or stones, it is forfeited, or laid out, by the hewer.
- Landry-box*—A box at the top of a set of pumps into which the water is delivered.
- Landsale*—Coals sold to the country in the neighbourhood of the pit.
- Levels*—Gutters for the water to run in.
- Limmers*—The shafts by which the horses draw.
- Lining*—Dialling, or surveying underground.
- Lowe*—A light—"piece of lowe"—part of a candle.
- Machine*—The winding-engine.
- Marrow*—A partner.
- Main engine*—The pumping-engine.
- Maul*—A large hammer.
- Metal stone*—Argillaceous stone.
- Metal rig*—The strata forced up by a creep.
- Meetings*—The middle of a pit or inclined plane.
- Mistress*—A lantern used by the drivers in the main airways.
- Mothergate*—The bord along which the coals are trammed from a district of workings.
- Mudds*—Small nails.
- Nicking*—The holing made by the hewer in the side of the coal.
- Nickings*—The small coal worked in forming the nicking.
- Off-take-joint*—The joint by which the bucket is fastened to the spears or rods.
- Off-putter*—A man employed in shipping the coals.
- Onsetter*—The man who sends the coal from the bottom of the pit.
- Opencast*—An open cutting.
- Outset*—The height which the top of a pit is raised from the surface, generally from 12 to 20 feet.
- Outbye*—*Outbyeside*—Nearer to the bottom of the pit.
- Overman*—An underground overlooker.
- Overings*—The top framing of a waggon.
- Outcrop*—When the coal-measures rise up to the surface.
- "Out of the house"*—A pumping-engine is said to go out of the house in the down stroke.

- Pair of gears*—Two upright props with a cross-piece at the top, for the support of the roof, or for forming wood bridges, staiths, &c.
- Parting*—An horizontal separation in the coal or stone.
- Peck*—A measure containing 1,209 cubic inches.
- Pinch*—A lever.
- Pick*—An instrument used in working coal, stone, &c.
- Plugman*—The man in charge of the pumping-engine.
- Plug*—A circular piece of wood to fill up a borehole, &c.
- Plum*—Perpendicular.
- Post*—Sandstone.
- Prop*—A piece of wood for supporting the roof.
- Punch-prop*—A short prop.
- Putters*—Young men who convey the coals from the workings to the horseway.
- Pulleys*—Wheels over which the pit-ropes run at the top of the pit.
- Pulley-frames*—Frames for the support of the pulleys.
- Ramble*—Stone or refuse coal which lies on the top of the coal-seam, and falls down in working the vein.
- Renk*—The average distance the coals are brought by the putters.
- Rests*—The machinery at the top and bottom of the pits, on which the shaft carriage is supported during the time of changing the tubs.
- Rings*—Gutters cut round the shaft to collect the waste water.
- Ridding*—Clearing away a fall of rubbish.
- To ride*—To ascend up the pit.
- Round coals*—Large coals.
- Roof*—The strata immediately above the coal.
- Rope-rolls*—The drums on which the ropes of the winding-engine are wound.
- Rolleys*—Carriages for conveying the tubs or corves underground.
- Rolleyway*—Underground railway.
- Rolleywaymen*—Men who lay and repair the rolleyway.
- Rusty coals*—Coals discoloured by water or exposure to air.
- Settle-bords*—The platform at the top of the pit.
- Screens*—Boxes, or spouts placed at an inclination, with longitudinal openings to separate the small coal from the large.
- Screener*—A man who fills the coals from the screens into the waggons.
- Scale of air*—A small portion of air abstracted from the main current.
- Scars*—Clinkers.
- Scraper*—An instrument for bringing the dust out of the drill-hole.
- Seasale*—Coals sent by shipping.
- Shaft*—A pit.
- Sheth of bords*—A district of workings.
- Sheth-door*—A door used for ventilating the back workings by coursing the air.
- Sheth-stopping*—A stopping as above.
- Shaft-walls*—Strong pillars of coal left near the bottom of the pit.
- Shift*—The time of working for one day.
- Shifter*—A man who prepares the working-places at night.
- Shear-legs*—A wooden framing used for raising weights, boring, &c.
- Sheave*—A wheel or roller.
- Sheaths*—The upright framing of a waggon.
- Shingley coals*—Small pieces of coal but free from dust.

- Shot*—A charge of powder.
- Shifting kavelers*—The men who are first for removal from one working-place to another.
- Siding*—A turnout where the empty and full sets pass.
- Sleck*—Mud deposited by water.
- Smart-money*—Money paid weekly by the owners to persons who have received an injury in the work.
- Snore-holes*—The holes in the windbore to admit the water.
- Sinker*—A man who sinks pits.
- Spouts*—Boxes down which the coals are run from the waggons into the ships.
- Splitting the air*—Dividing the air into different portions, each ventilating a separate district of the mine.
- Spears*—Pumping-rods.
- Sneck*—A catch to fasten a door, &c.
- Soles*—The bottom framing of a waggon.
- Staith*—The shipping-place for the coals.
- Staithman*—The man who overlooks the shipping of the coals.
- Staple*—A small pit.
- Stay*—A support.
- Start*—The lever of the crab or gin, to which the horse is attached.
- Standage*—Space for water to accumulate in.
- Stemming*—The stuff beaten down upon a charge of powder.
- Stenton*—A passage between two winning headways.
- Stenton-wall*—The pillar of coal between two winning headways.
- Stopping*—Walling put into any passage to block it up so as to carry the air forward.
- Stonehead*—The rock immediately below the alluvial deposit.
- Stowing*—Rubbish put into old workings to fill them up.
- Stowbord*—A place into which rubbish is put.
- Stythe*—Choke-damp or carbonic acid gas.
- Sump*—The bottom of the pumping-pit.—A catchwater drain.—The part of a judd of coal first brought down.
- Sumping-shot*—A charge of powder for bringing down the sump, or for blowing the stone up in a sinking-pit.
- Swad*—A thin layer of stone or refuse coal at the bottom of the coal-seam.
- Tail-crab*—The capstan on which the spare rope of the crab is wound.
- Ten*—A measure containing 420 and in other cases 440 bolls, Winchester measure.
- Tentale-rents*—Rent paid to the lessor at so much per ton.
- “Tear war”*—A signal that men are ready at the bottom to ascend up the pit.
- Thill*—The floor of the mine.
- Towt*—A piece of old rope.
- Token*—A piece of leather with a distinct mark for each hewer, one of which he sends up with each corf or tube.
- Trapper*—A boy who opens and shuts the air-doors.
- Trouble*—A dislocation of the strata.
- Trimmers*—Men who spread the coals in the ship’s hold.
- Tram*—A carriage for carrying the corves or tubs.
- Tubs*—Boxes for conveying the coals.

- Upcast-pit*—The pit up which the air ascends after ventilating the mine.  
*Under the top*—In bad roofs where part of the coal is left and cut in the form of an arch.  
*Underlevel drift*—A drift driven from the pumping-pit to un-water dip-workings.  
*Vend*—The whole quantity of coal sent from the colliery.  
*Viewer*—The superintendent of the mine.  
*Wall*—A passage between the bords.  
*Waste*—The old workings.  
*Wailing*—Cleaning the coals.  
*Waler*—Boys who pick the refuse from the good coals.  
*Waste-boxes*—Boxes in which the waste water of the pumping-pit is conveyed from the rings.  
*Wayleave*—Liberty to make a railway over any ground.  
*Wasteman*—A man who looks after the ventilation.  
*Waiter-on*—A man who attends at the top of a sinking-pit.  
*Waggonwright*—A man who makes and repairs the chaldron waggons.  
*Whin*—Any very hard stone.  
*Winning*—A new opening.  
*Winning headways*—Headways driven to explore and open out the coal-seam.  
*Whole*—Where the coal has not been previously worked.  
*Whimble*—A hollow instrument for cleaning the rubbish out of a borehole.  
*Winding-engine*—The engine which draws the coals up the pit.  
*Windbore*—The pump at the bottom of a set of pumps.

#### NORTHUMBERLAND AND DURHAM.

- Acre, statute*—4,840 square yards.  
*Acre, Cheshire*—10,240 do.  
*Adit*—Level driven into the mine from the surface.  
*Adventurer*—Coal-miner or lessee.  
*After-damp*—The azotic gas remaining after explosion.  
*Air current*—Volume of air.  
*Air-pipes or boxes*—For exhausting or inserting air.  
*Air-way*—Passage for the air.  
*Air-pump*—For exhausting air.  
*Air drawing*—When the pump draws part air and part water.  
*Alluvial*—The deposit on the rocky strata.  
*Anthracite Coal*—Stone-coal, which yields very little of either smoke or flame.  
*Available*—Capable of being realized.  
*Azote*—Gas inimical to animal life.  
*Back-shaft*—In contradistinction to the coal-drawing shaft.  
*Back-drift*—Ditto to horse-drift.  
*Bad Air*—Adulterated with gas.  
*Band (black)*—Scotch ironstone.  
*Bands*—Layers of shale or sandstone interstratified with the coal.  
*Band (Heworth)*—Peculiar to that locality.  
*Barrier*—Whole coal left at the boundary or between workings.  
*Barrow*—Wheel carriage.  
*Barrow-way*—Tram-road formed with planks.



- Basis*—The grounds or foundation.
- Basonic*—Of bason shape.
- Beam-spring*—Part of the engine-framing.
- Bearers*—Women who carry coals upon their backs.
- Bearing system*—The carrying of coals upon the backs of females.
- Beater*—Part of the blasting apparatus.
- Bed*—The surface of strata or bottom of walling.
- Bind*—Sandstone or hard shale.
- Balance-weight*—To counteract the load.
- Baulk*—An interruption in the coal.
- Bit*—A little; a boring implement.
- Bituminous*—Possessing much bitumen.
- Black band*—Ironstone abounding in Scotland.
- Black damp*—Carbonic acid gas.
- Black spittle*—The product of the lungs in the blind coal collieries.
- Blast*—Explosion of inflammable air or gunpowder.
- Blast (Water)*—The rushing out of compressed air through water.
- Blasting*—Blowing up the coal by means of gunpowder.
- Blind Coal*—Anthracite coal.
- Block*—Quantity of coal.
- Blower*—A violent discharge of gas from an orifice in the stone or coal.
- Board-end door*—Used for ventilating that single place.
- Boll*—A customary coal measure, 9,678 cubic inches.
- Bolt-hole*—For circulating air.
- Bore-hole*—To ascertain the strata.
- Bore-rods*—To perforate the strata.
- Bottom board*—For discharging at the bottom of the waggon.
- Boundary*—The division between properties.
- Bovey Coal*—A species of lignite, or charred wood.
- Brace head*—A boring implement.
- Brake*—For retarding machinery; a boring implement.
- Brattice*—A wooden partition for conveying air.
- Breeding Fire*—Spontaneous ignition from small coals.
- Breach*—Breaking through.
- Breaker*—One of the colliers who wedges down the coal.
- Broad gate*—A main working.
- Broad wall*—The taking away of all the coal; long wall.
- Brushing*—A violent motion to remove the gas.
- Bucket*—Part of the pump apparatus.
- Bucket-tree*—The pump to which the bucket-door is attached.
- Bunting*—Beam across the shaft.
- Burner*—That part of the lamp which contains the wick.
- Butty collier*—A contractor for working and conveying the coal.
- Cabin*—A hut or hovel.
- Cage*—A frame for containing the tubs where conductors are used.
- Calcination*—Roasting coal or ironstone.
- Cannel coal*—Remarkable for its illuminating power.
- Carboniferous*—Strata containing coal.
- Carbonized*—Coal coked.
- Catch-pin*—Attached to pumping-beam.
- Catrake*—Apparatus for regulating the speed of the engine.
- Certain rent*—Fixed rent; farm.

*Char*—Coke.

*Chain-pump*—Worked with an endless chain, fitted up with leather buckets fitting the pump; as the chain revolves over a wheel, each bucket delivers a quantity of water.

*Chalk*—Carbonate of lime.

*Channel*—A grove or space.

*Chingle*—Small coal.

*Chisel*—A boring instrument.

*Chink*—An opening in the strata.

*Chirt*—Strata similar to flint, accompanying lead strata.

*Choke damp*—Carbonic acid gas, inimical to animal life.

*Cinder-coal*—Coke.

*Circumferenter*—Miners' compass.

*Cistern*—For containing water.

*Clack*—A valve at the bottom of the pumps.

*Clack door*—Attached to ditto for changing.

*Clack-piece*—The pump in which the clack is fixed.

*Clams*—Screw hoops around the pumps.

*Cleading*—Deals nailed on to the buntings.

*Clean coal*—Unmixed with band or refuse.

*Clearer*—The collier who holes under the coal.

*Cleavage*—Fracture of the coal.

*Cliffes hook*—Used in sinking.

*Clunch*—A soft white substance like pipe-clay.

*Coal-seam*—Bed of coal.

*Coal-bason*—The general form of coal-fields.

*Coke*—Calcined coal.

*Collarings*—Cross timbers to steady the pumps.

*Collier*—The worker of coal.

*Colliery*—Establishment for raising coal.

*Communications*—Holings in the wall.

*Column of air*—Air-current.

*Column of pumps*—Set of pumps.

*Compass*—Circumferenter; surveying instrument.

*Conductors*—Guides for the cage, fixed in the shaft, and constructed of wood or iron.

*Concession*—Belgian term for lease.

*Corf*—Wicker basket for containing coals.

*Courses*—Tiers of wood or iron.

*Courses (Air)*—Passages for the air.

*Coursing*—Carrying the air through the workings.

*Counter-balance*—A counteracting weight in machinery.

*Crack*—Crevice.

*Crank*—Force-pump driven by horses or steam to force the water up from the dip.

*Crab*—Windlass worked by horses. Varieties: main-crab, ground-crab, tail-crab.

*Crab-rope*—For lifting the pumps, &c.

*Cradle*—A wooden seat attached to a rope, for working in the shaft.

*Crane-place*—The depôt where the coals are transferred from the trams to the rolleys.

*Creel*—The basket used by a bearer-woman to carry coals.

- Creep*—The movement of the stratification where the pillars are left too weak, or where the floor is very soft.
- Crossing*—Where one column of air is made to cross over another.
- Crow-coal*—The uppermost seam.
- Crush*—The strata affected by intense pressure; creep.
- Cuffat*—The tub used for drawing the coals in Belgium.
- Curb*—Ring of wood or iron fixed in the shaft. Varieties: wedging, spiking.
- Dart*—The direction of the air-current in drawings.
- Dam*—An artificial building for the stoppage of air or water. Varieties: clay, stone, timber, iron.
- Davy lamp*—After the inventor, Sir H. Davy; safety-lamp.
- Debris*—The refuse of the mine; outcrop of seam.
- Dial*—Miners' compass.
- Diagonally*—A working pointing in a direction between dip and rise.
- Dip*—The lower level of a coal-mine.
- Dislocation*—Where one part of the strata has been severed from the other; a dyke or trouble.
- District*—Part of a mining-field.
- Doggy*—The deputy of the butty collier.
- Doors, for checking the air*—Varieties: single, double, sheth, board end, and brattice.
- Downcast*—The current of air downwards.
- Draft*—The artificial impulse given to the air.
- Drainage*—The abstraction of the water of the mine.
- Drawdown*—Downcast.
- Drift*—Passage excavated in the mine.
- Drift (dumb)*—Passage allotted to the foul air.
- Drill*—Implement for boring, sinking, or blasting.
- Drowned*—Workings filled with water.
- Dyke*—Interruption in the coal-mine. Varieties: clay, flat, slip, whin.
- Dyke (upcast)*—Where the coal, on approaching the dyke, is thrown upwards; and, *vice versâ*, downcast.
- Edge seams*—Seams which lie at an angle exceeding 40 deg. are called edge seams.
- Engine (winding)*—For drawing coal.
- Engine (pumping)*—For drawing water.
- Eudiometer*—Apparatus for measuring the velocity of the air.
- Explosions (general)*—Where considerable quantities of gas explode.
- Face airing*—The current passed round the extremity of the workings.
- Fall*—When the roof stone gives way.
- Fan-blast*—A means of propelling the air-current by the revolutions of a machine.
- Fathom*—A measure, 6 feet.
- Fault*—Interruption of coal, dyke, trouble.
- Feeders (partial)*—Temporary springs of water.
- Feeders (general)*—Ditto, which remain permanent.
- Fighting of pits*—The deviation of the air-current between downcast and upcast.
- Fire-damp*—Carburetted hydrogen gas.
- Fire (partial)*—Common occurrence.
- Fire (breeding)*—Produced by accumulation of small coals.

- Fire-rib*—Barrier of coal for the insertion of dams.
- Fire (standing)*—When the coal or gas remains seriously ignited.
- Fiery mines*—Producing much gas.
- Fire-clay*—Shale which withstands fire, produces fire-bricks.
- Fish-head*—An implement used for drawing clacks.
- Fissure*—The fracture of the strata at a fault, or otherwise.
- Filler*—The collier who fills the coal-tubs.
- Five-folds*—A set of sheaves for multiplying power for the lifting of pumps, &c.
- Flat seams*—In contradistinction to edge seams.
- Flakes*—Sheets of vapour nearly inflammable.
- Floor*—The strata whereon the coal rests.
- Flue*—Horizontal chimney.
- Footage*—Rent payable by the foot thick per acre.
- Forewinning*—Previous advanced workings.
- Foul*—Contaminated with gas.
- Formation*—The form or deposition of strata.
- Forcing set*—The water forced up by a solid piston, instead of the ordinary pump and bucket.
- Fossil*—Alluvial substance now mineralized.
- Franc*—French coin, 10*d*.
- Funnel*—Erection for receiving or discharging the air.
- Furnace*—Large fire either employed for ventilation or otherwise.
- Fuze (patent)*—For communicating a light to gunpowder in blasting.
- Gag*—Obstruction in the bucket or clack.
- Gang*—A company of workmen.
- Gallery*—Passage in the mine.
- Gangway*—Artificial road constructed of timber.
- Gate-road*—Horse-road.
- Gear*—Utensils used in mining or machinery.
- Geological*—Appertaining to the earth.
- Gin (common)*—For drawing coals by horse-power.
- Gin (cog and rung)*—The ancient gin for drawing coals.
- Gin (jack)*—Especially used for working in the engine-shaft.
- Goaf*—A hollow.
- Goaves*—Plural of goaf.
- Gob*—The part excavated, goaf.
- Gravel-bed*—A wash of sand and gravel found many fathoms under the surface.
- Greenstone*—Whin, basalt.
- Grit*—A rough coarse sandstone.
- Ground-spears*—Applied to the hanging of pumps.
- Ground-ropes*—Belonging to the five-fold sheaves for do.
- Growth of water*—Springs of water.
- Gubbin*—A species of ironstone in Staffordshire, found in disconnected rounded masses.
- Headways*—Exploring-drifts.
- Heapstead*—The elevation of the shaft above the surface for skreens, &c.
- Hitch*—A minor fault in which the coal has been severed, not exceeding the thickness of the seam.
- Hogger-pump*—The top pump, furnished with leather bag to connect the delivery of water with the cistern.



- Hollow*—Gob, goaf.
- Hopper*—A chest or receptacle for small coals.
- Horse-gate*—Rolley-way.
- Hostmen*—A chartered company of merchants for carrying on the coal trade of Newcastle-upon-Tyne.
- In-by*—Those portions of the workings beyond the crane or depôt.
- Inlet*—Passage into the mine, downcast.
- Inferior*—Lying under level or below the other parts.
- Intersected*—Cut across.
- Inclined plane*—Artificial arrangement for lowering or hoisting the produce of the mine.
- Intake*—The passage which conveys the air inwards.
- Ignite*—The act of taking fire.
- Incombustible*—Incapable of being burnt.
- Ironstone*—The raw material, stone of which iron is made.
- Jack-roll*—Hand windlass.
- Jack-rope*—Attached to jack-gin.
- Jigg-brow*—Inclined plane.
- Keel*—A barge for conveying coals.
- King-post*—Apparatus for strengthening the beam.
- Laminated*—Constructed in layers.
- Lamp*—For rarefying, safety-lamp.
- Lap*—The part whereon the rope coils.
- Lessee*—The tenant.
- Lessor*—The landlord.
- Level (horizontal)*—Neither dip nor rise.
- Level (free)*—Discharging at the surface without engine-power.
- Lift*—A column of pumps.
- Lifting-pump*—Common pump.
- Lodge*—A temporary hut for sinkers.
- Long wall*—The taking away of all the coal by first process, in contradistinction to pillar and stall.
- Man of war pillars*—Principal support in the thick-coal workings.
- Marl*—A species of fire-clay in connexion with magnesian limestone and turf.
- Maul*—Used in sinking and coal-working.
- Metre*—French measure of 37·39 inches.
- Mountain limestone*—Blue, and in contradistinction to the magnesian.
- Naked candle*—Unenclosed.
- Nip*—An irregularity or thinning in the seam of coal.
- Nook*—Angle.
- Offtake joint*—For convenience of disjoining.
- Opening*—Excavation.
- Orrell coal*—Lancashire, celebrated for its superiority.
- Outcrop*—Where the seams appear at the surface.
- Outlet*—Escape, egress.
- Out-by*—The roadways between the crane and the shaft.
- Outfittings*—Appendages.
- Overlap*—Two seams coming in close contact with each other.
- Overman*—The daily manager of the pit.
- Do. (deputy)*—Assistant.
- Pannel working*—Working by divisions.

- Parrot coal*—The celebrated gas-coal of Scotland.
- Passage*—A holing or communication.
- Piles*—Planks, the ends of which are armed with iron for penetrating sand.
- Pillar*—Block of coal.
- Piping*—Conveyance of gas through pipes.
- Piston*—The moveable part within the pump.
- Pitman*—Collier.
- Pit candle*—Purposely small, viz. 30 or 40 to the lb.
- Plank (pit)*—For supporting the loose stone.
- Plate*—A species of shale.
- Plunger*—Used in forcing water.
- Porous*—Open.
- Pricker*—An implement used in blasting.
- Prop*—Timber for supporting the roof.
- Puddle*—Liquefied clay or soil.
- Pump-rod*—Attached to the bucket.
- Putter*—One who conducts the tub or basket of coals from the hewer.
- Pyrites*—Sulphate of iron.
- Quadrant*—Temporary pumping-beam at pit top.
- Quarter*—The fourth part of a yard = 9 inches, a term applied to the thickness of coal.
- Quicksand*—Fine sand so mixed with water as to render it fluid.
- Ram*—The plunger of a forcing set of pumps.
- Rarefy*—To heat air to produce expansion.
- Reek*—Smoke.
- Rent (certain)*—Fixed, farm.
- Rent (royalty)*—Payable by the ton.
- Rest*—A boring implement.
- Return air*—After it has traversed the workings.
- Rib-fire*—Coal barrier for insertion of a dam.
- Ring*—Applied to the skips of Staffordshire, also the horizontal groove formed in the shaft for the collection of the water.
- Rise*—The upper plane of the coal-bed, in contradistinction to dip.
- Robbing*—Cutting away part of the pillars.
- Roll*—An excrescence of the roof or floor of the mine.
- Roll-rope*—The drum upon which the rope laps.
- Rolley (out-by)*—The wheel-carriage and horse-road into the mine.
- Rolley (in-by)*—The horse-carriage used between the crane and the workings.
- Rolley-way*—Edge railway, in contradistinction to tram-way.
- Roof*—The strata immediately resting upon the coal.
- Royalty*—Mine rent, tonnage.
- Rubbish*—The debris, waste.
- Runner*—A boring implement.
- Sandstone*—Silicious strata.
- Scaffold*—A wooden platform fixed across the shaft.
- Scraper*—A blasting implement.
- Section*—Profile of the strata.
- Set (standing)*—Fixed in a cistern at the bottom of pit.
- Set<sup>ts</sup> (hanging)*—Pumps hung upon chains or ropes.
- Shaft*—Pit, round or square; rope-roll shaft.

- Shale*—Strata without mixture of silica.
- Shear-legs*—Tall framing above the engine-pit.
- Sheave*—Pulley.
- Sheathing*—Thin deal applied to the joints of tubbing.
- Sheth-door*—Or stopping to guide the main air-current.
- Shorts*—Prepaid rents for which coals are allowed to be worked.
- Side-lane*—A process in the thick coal, preparatory working.
- Siding*—Railway pass-by.
- Silicious*—Containing silex.
- Sinker*—The person who sinks shafts.
- Skip*—Frame used in Staffordshire in drawing the coals.
- Skeleton-plan*—Confined to the illustration of a certain subject.
- Skreen*—Apparatus for separating the small coal from the large.
- Slack*—Small coal.
- Sledge*—Wooden frame whereon to convey the coal.
- Sleeper*—On which the railway is fixed.
- Sliver*—Wood or iron between the joints of planks to render them air-tight.
- Slot*—A bolt or fastening.
- Small coal*—That passed through a skreen or riddle.
- Smelting*—The melting of iron from the raw material.
- Snore-holes*—For admitting water into the windbore of pumps.
- Sooty*—The produce of coal from attrition, the appearance at the out-crop.
- Sorting*—Separation, classification.
- Spanner*—Part of the working gear of engine.
- Spare*—A wedge used in the construction of tubbing.
- Spigot and Fawcett*—One part of a pipe going within the other.
- Spiral*—The centrifugal ventilator of Belgium.
- Spontaneous combustion*—Ignition from the decomposition of coal pyrites, &c.
- Splint-coal*—Grey laminated open-burning steam-coal.
- Splitting*—Subdividing.
- Stair*—The ladder or circular apparatus for ascending and descending the Scotch coal-pits.
- Staith*—Building wherein to deposit coal for future removal.
- Stall*—Excavation, bord, wicket.
- Stamper*—For forcing soft stone into the drill-hole.
- Standage*—Space for retaining water.
- Staple*—A minor shaft sunk from seam to seam.
- Start*—The arm of the gin.
- Steam-coal*—Open-burning coal, splint, coal that will not cake.
- Steel-mill*—The substitute for a candle before the invention of the safety-lamp.
- Stem*—To stuff the drill-hole with soft material.
- Stenting*—A holing between the pair of exploring drifts or headways.
- Stithe*—Carbonic acid gas.
- Stone-coal*—Anthracite.
- Stone-head*—Top of strata.
- Stopper*—Apparatus attached to the skreen for saving the breakage of coals.
- Stopping*—To guide the air-current.

- Stowing*—The artificial pillaring up of excavation.
- Streak*—Imaginary level line, water-level.
- Sumerge*—To rise up from below.
- Sulphur*—Inflammable or other noxious gas.
- Sump*—That part of a shaft sunk below the coal for standage.
- Superior*—Lying above.
- Surveyor*—The surveyor and planner of the workings.
- Sweep*—The oar used at the stern of the coal keel.
- Synopsis*—Summary view.
- Taille*—Board, wicket, Belgian.
- Tapping*—The draining or drawing off.
- Thill*—The stratum upon which the coal rests.
- Throw*—The effect of slip-dykes, by which one part of the strata is left above the other.
- Thrust*—Where the pillars are taken away, and the mine is left a mass of ruin.
- Timbering*—Composed of curbs, planks, &c.
- Tomahawk*—An implement used in sinking.
- Tonnage*—Computing by the ton.
- Topit*—An implement used in boring.
- Trail*—To draw.
- Tram*—A slight wheel-carriage for conveying the tub or basket.
- Tram-way*—Rectangular plates of iron constructed for trams with sharp wheels.
- Trap-door*—For checking the air-current.
- Trapper*—The person who attends the trap-door.
- Travel*—The traversing of the air-courses.
- Trouble*—Interruption in the coal, fault, dyke.
- Trying the candle*—Judging by its appearance as to the state of the air.
- Tub*—For drawing water.
- Tubbing*—For stopping water, constructed of wood, stone, or metal.
- Tube*—A chimney for the purpose of ventilation.
- Under-viewer*—The resident or deputy viewer.
- Ungearing*—Disconnecting machinery.
- Upcast*—The shaft which discharges the air from the mine.
- Valve*—For opening or shutting off air, steam, or water.
- V-bob*—A diagonal movement for pumping.
- Viewer*—The manager of a colliery.
- Vis inertiae*—A dead weight, gravity.
- Waggon-way*—Railway.
- Wain*—The cart used for conveying coals previous to the introduction of railways.
- Walling*—Building of brick or stone.
- Wash*—Formation of sand and gravel.
- Waste*—Old workings.
- Water-blast*—Compressed air forcing up water.
- Waterfall*—Stream of water falling down the shaft.
- Water-level*—Neither dip nor rise.
- Water-tight*—Impassable to water.
- Wayleave*—Right of passage.
- Wedging out*—The thinning of strata.
- Wilon*—Basalt, greenstone.



- While coal*—Before any coal is worked.  
*Wildfire*—Inflammable air.  
*Wimble*—An implement used in boring.  
*Windgate*—Air-passage.  
*Winding-shaft*—Where the coals are drawn.  
*Windlass*—Jack-roll, crab, or other purchase.  
*Winning*—Exploring, the process of establishing a colliery.  
*Wire-gauze*—The constituent of the safety-lamp.  
*Witchets*—A wicket, board, stall.  
*Workable*—Seams sufficiently thick to be worked to a profit.  
*Working-barrel*—The pump whereon the bucket hooks.  
*Workings*—The excavations of a colliery.
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## SPAIN.

- Abra*—A fissure, a considerable opening or cavity in the mountain, rock, or lode.  
*Abronzado*—Yellow copper ore, sulphuret of copper.  
*Acarreadores*—Wood carriers.  
*Acero*—Steel.  
*Achicar*—To decrease, to diminish; applied to the diminution of water in any of the workings, lowering the water in shafts, &c.  
*Achicadores*—Workmen employed in removing the water in *botas*.  
*Acuna*—Die for coining.  
*Acunacion*—Coining.  
*Acunador*—One who coins.  
*Acunar*—To coin.  
*Ademador*—A mining carpenter; a timber-man.  
*Ademar*—To timber.  
*Ademe*—Timber-work for supporting and securing the works of the mine.  
*Adobes*—Unburnt bricks made of straw, earth, and dung, dried in the sun.  
*Adminstrador*—Superintendent.  
*Administracion*—Administration, management.  
*Afinacion*—Refining.  
*Agata*—Agate.  
*Aguafuerte*—Aquafortis, nitrous, or nitric acid.  
*Ahondar*—To sink, to deepen.  
*Ahonde*—Sinking or driving downwards.  
*Alabastro*—Alabaster.  
*Albanil*—Mason, bricklayer.  
*Albaradon*—A dyke.  
*Albayalde*—White lead.  
*Albergue*—A natural hollow, a den.  
*Alcohol*—Galena, sulphuret of lead.  
*Alcribis o Tovera*—The tuyere of a smelting-furnace.  
*Alear*—To alloy metals.

- Aleacion*—The art of alloying metals.
- Alhondiga*—Corn-market or public granary.
- Alimentos*—In mining, an allowance to mine-owners, as subsistence, until their mines become profitable.
- Almacén*—A store-house, store-room, warehouse.
- Almadeneta*—A stamp-head.
- Almagra*—Ruddle, red ochre.
- Almud*—Twelfth part of a fanega.
- Alquifol*—Galena.
- Alquilar*—To hire.
- Alto*—The upper part.
- Alumbre*—Alum.
- Ambar*—Amber.
- Amatista*—Amethyst.
- Amianto*—Amianthus.
- Amoldar*—To mould.
- Amonedar*—To coin.
- Amparo*—The maintenance of the legal right of ownership by continued possession. In mining, this can only be preserved by keeping a certain number of men at work at certain periods, as determined by the mining code.
- Anchura*—Width, roominess.
- Angulo*—An angle, a corner.
- Antimonio*—Antimony.
- Aparejo*—A tackle, a block and fall, an apparatus; a set of harness for beasts of burden or draft; a pack-saddle.
- Apartado*—Establishment for parting silver and gold.
- Aperos*—Utensils; also materials, such as gunpowder and paper for blasting, &c.
- A pique*—*Trabajar a pique*—Digging downwards in a vertical direction.
- Apolvillados*—Rich ores.
- Apuradores*—Men who rewash the earth from the tinas.
- Arcilla*—Clay.
- Arena*—Sand.
- Arenilla*—Fine sand.
- Arrastrar*—Applied to where veins unite and form one; to drag.
- Arrastre*—Mill for grinding ores, employed in the process of amalgamation of silver ores and of gold.
- Arreador*—Horse-driver for malacates.
- Arroba*—25 lbs. Spanish weight.
- Arriero*—A muleteer.
- Arsenico*—Arsenic.
- Asbesto*—Asbestos.
- Aserrador*—A sawyer.
- Aserrar*—To saw.
- Asfalto*—Asphaltum.
- Astillero*—Open forest, pasture for mules, &c.
- Atacadera*—A rammer.
- Atacador*—Rod for ramming in the charges for blasting.
- Atajador*—A boy who attends the horses and mules.
- Atajo abierto*—Applied to a mine when worked in the manner of a quarry, or by an open cut in a rock or mountain.

- Atargea*—Water-courses of masonry.
- Atecas*—Labourers who collect the water in buckets from the planes of the mines, in order to pass it off by the shafts ; also, men who fill the skins in the shafts with water, mud, &c.
- Atierres*—Attle, rubbish ; in the mine, earth preventing the continuation of the work.
- Atisador*—A stoker, man who attends the furnace.
- Audiencia*—Principal tribunal of justice.
- Aviado*—The mine-owner supplied with funds for working his mines.
- Ariador*—He who supplies funds for working mines.
- Avio*—Funds advanced for working mines.
- Avios*—Implements.
- Ayudante*—Assistant.
- Azabache*—Jet.
- Azanca*—A leat.
- Azarcon*—Red lead.
- Azogue*—Quicksilver ; silver ore adapted for amalgamation.
- Azogue apolvillado*—Very good ore for ditto.
- Azogue common*—Common ore for ditto.
- Azogue ordinario*—Ordinary ore for ditto.
- Azogue razonable*—Middling ore for ditto.
- Azogue en caldo*—Quicksilver.
- Azogueria*—The ware-room, in which quicksilver is kept in store.
- Azoguero*—An amalgamator ; person who superintends the process of amalgamation.
- Azufre*—Sulphur.
- Azufre vivo*—Native sulphur.
- Bancos*—Rocks, which intercept the vein, or cause it to take a different direction.
- Banquillos*—Stools on which the marquetas are placed.
- Bano*—The last portion of quicksilver applied to a torta.
- Barquina*—A large furnace.
- Barquines*—Forge bellows.
- Barra*—A bar, an iron crow ; equal shares into which the interest in a mine is divided, usually 24 in number.
- Barra de plata*—A bar of silver, usually about 135 marcs, or 1,080 oz.
- Barranca*—A ravine.
- Barrena*—A drill or borer used in blasting.
- Barrenadores*—Miners who work with the borer and mallet.
- Barrenar*—To bore.
- Barrenero*—A boy who attends with the boring-tools.
- Barrenos*—Holes made for blasting.
- Barreta*—A miner's bar or crow.
- Barreteros*—Miners who work with crow-bars, wedges, or pick.
- Barro*—Clay, loam, mud.
- Basalto*—Basalt.
- Batea, or Apuradera*—A bowl used in rewashing.
- Bazo*—Beneath, low, lower part.
- Beneficiar*—To extract the metal from the ore ; to dress ore.
- Beneficio*—Making the metallic contents of the ore available by reduction.
- Beneficio de cazo*—Reduction of ore by amalgamation, conducted in a copper pan over a fire ; hot amalgamation.

- Beneficio de hierro*—Reduction of ore by amalgamation, with the addition of fragments of iron.
- Beneficio de patio*—Reduction of ore by amalgamation, in sheds or open court-yards.
- Beneficio de pella de plata*—Applied when a portion of amalgam of silver is added to the mass under amalgamation.
- Beneficio de la colpa*—A method of amalgamation, in which, instead of *magistral*, *colpa* (colcothar) is used.
- Beneficio por fuego*—Reduction of ore by smelting.
- Berilo*—Beryl.
- Bigorneta*—A small anvil.
- Bigornia*—An anvil.
- Bismut*—Bismuth.
- Blandura*—Soft, crumbly ground.
- Blenda*—Blende, sulphuret of zinc.
- Boca*—Mouth, entrance, or pit of a mine; first opening made in the vein.
- Boca mejora*—A shaft or boca to communicate with the entrance of the vein to facilitate the workings.
- Bochorno*—Vapour, or foul air; want of ventilation; suffocating heat.
- Boletas*—Tickets of sale of ores; cheque tickets; account of charges, and produce of one amalgamation operation.
- Bolsa*—A purse; sometimes applied to a bunch of good ore of the supposed shape of a full purse or bag.
- Bomba*—A pump.
- Bonanza*—Prosperity; fine weather. A mine in *bonanza* is in a prosperous state; stopping costs, yielding profit.
- Bordes*—Border; ore left untouched by previous working in an old mine-work.
- Bordeta*—A small pillar.
- Borrasca*—Adversity; foul weather. A mine in *borrasca* is in an unproductive state; does not stop costs.
- Bota*—A leather bag or sack, made of one or more ox-skins, in which water is lifted in the mines.
- Bota chica*—Small leather bag.
- Bota grande*—Sack made of 2 or  $2\frac{1}{2}$  hides, used to extract water, and worked by horse-whims.
- Botilla de burro*—Sack, or bag, made of one neat hide, to extract water, and worked by a burro or hand-whim.
- Botilla de lomo*—Small sack made of one-third of a hide, to carry water out of small sinkings on men's backs.
- Boveda*—Vault, arch.
- Braceage*—Brassage in coining.
- Broculas*—Drills.
- Bronce*—Brass; gun-metal; iron pyrites.
- Buytron*—Furnace for smelting ores.
- Burilada*—A chip taken from a mass of silver to try whether it be standard.
- Burro*—A hand-whim; a windlass.
- Busca*—(Search.) The right to employ *buscones* frequently claimed by the administration and persons employed in mines.
- Buscones*—Tributors or miners who work on part proceeds; also, those



who search for ores in a metalliferous district generally, or in a mine for such ores as may have been neglected, and left behind by others.

*Caballerangos*—Horsekeepers.

*Caballitos*—Men who carry the mining captains or others.

*Caballo*—A horse; a mass of the steril mountain rock immersed in the lode.

*Caballo de tepatate*—A mass of barren rock interposed in a vein.

*Cadena*—A chain.

*Cajon*—In Peru and Chili, two montons of 32 quintals each, 64 quintals.

*Cajon de Granza*—The pit to receive the crushed ore.

*Cajonero*—A lander, or one who receives the bota or manta at the shaft's mouth.

*Cal*—Lime.

*Calde Estano*—Calx of tin.

*Calderas*—Boilers.

*Calentadura*—The first heating of the furnace, or putting the furnace into blast.

*Caliche*—Calcareous matters; ores of a calcareous character.

*Calicheros*—Lime-burners.

*Calientes*—Warm ores (in amalgamation) containing sulphuret of iron and copper, and no calcareous matter.

*Caliza, or Cal en piedra*—Limestone.

*Cal viva*—Quicklime.

*Campistas*—Tributors.

*Campo*—A pitch, a working in possession of buscones, or allotted to the proprietors or others.

*Canal*—A spout; a canal.

*Candallero*—A socket deeper than the chumacera, and used for the same purpose.

*Canella*—Used to convey the fire to the charge for blasting.

*Canon*—In a mine, a level, or horizontal gallery.

*Canos*—Pipes, tubes.

*Cantera*—A quarry.

*Cantero*—Stonemason; quarryman; a pitcher.

*Caparossa*—The person in charge of the sheds under which the tahonas are worked.

*Capellinas*—Large iron or copper bells, under which the quicksilver is separated from the silver in the amalgam by distillation.

*Carbon*—Coal; charcoal.

*Carbon de lena*—Charcoal.

*Carbon de piedra, or Carbon de tierra*—Pit coal.

*Carboneros*—Carriers, makers, and sellers of charcoal.

*Carcamo*—The drain which carries off the earthy matter from the tinas when washing the amalgam.

*Cardenillo*—Verdigris.

*Carena*—An upright stanchion for supporting machinery.

*Carga*—380 lbs. Spanish; a mule-load, varying in the different mining districts; a charge for blasting; a lode.

*Carpintero*—A carpenter.

*Carilleros*—Ore-carriers.

*Carretilla de mame*—A wheelbarrow.

*Carrita*—A waggon or cart.

- Carritero*—A waggoner.  
*Casa de moneda*—The mint.  
*Cascajal*—A gravel-pit.  
*Cascajo*—Gravel, rubbish.  
*Caso*—A boiler used in hot amalgamation.  
*Castillo*—The frame of the stamping-machine.  
*Castina*—Fluor or flux.  
*Cata*—A mine of no great depth ; a pit made in quest of the vein ; a mine denounced for trial.  
*Catear*—To search for new mines.  
*Catero*—A searcher for mines.  
*Caxa*—Money chest ; treasury.  
*Caxa del tiro*—Reservoir at the bottom of the shaft ; sump of the pit ; that part of the pit below the deepest level driven from it.  
*Cazo*—A measure of ore containing many quintals, but varying in bulk at different places ; at Potosi, 5,000 lbs. ; a handbarrow.  
*Caxoneros*—Landers at the mouth of a shaft.  
*Cebar*—To feed ; to supply a furnace with materials for smelting ; to add quicksilver to a mass of ores under amalgamation.  
*Cebo*—Priming, as of gunpowder ; a feed, as oats for horse ; second addition of quicksilver to the torta.  
*Cedazos*—Sieves.  
*Cendrada*—The bottom of the refining or cupelling furnaces, made of very fine earth and vegetable ashes which have been lixiviated ; materials of which a cupelling test is made ; the test itself.  
*Cendradilla ò Galeme*—Cupelo.  
*Cerro*—A mountain.  
*Cestas*—Baskets.  
*Chapas*—Iron blocks on which the stamps fall.  
*Charqueadores*—Cart-fillers.  
*Charqueo*—Filling the baskets by hand.  
*Chichicles*—Crystallized calcareous or other spar.  
*Chicuites*—Baskets.  
*Chiflon*—*Trabajar chiflon*—A phrase, meaning the work making way, both in length and depth.  
*Chino*—Iron or copper pyrites.  
*Chumacerá*—An iron socket for the sockets of shafts.  
*Cielo*—Roof of a work, an upward working. *Trabajar de cielo*, working at the roof or top of the vein.  
*Cilindro*—A cylinder.  
*Cinabrio*—Cinnabar ; sulphurate of mercury.  
*Claro*—An open space on the lode from which ore has been taken.  
*Clavos*—Masses of native metal, bunches or masses of ore ; nails.  
*Cobalto*—Cobalt.  
*Cobre*—Copper.  
*Cobre en roseta*—Rose copper.  
*Cobriso*—An inferior kind of copper ore.  
*Colero*—Assistant of the underground captain in charge of the peonada, or account of the daily labour.  
*Cohete*—A cartridge for blasting.  
*Collado*—A hill.  
*Colorados*—Ores coloured with red oxide of iron.—See *Pacos*.

*Comillo*—A reverberatory furnace.

*Comer los pilares*—To take away the pillars of the lode which had been left during the previous working of the mine to support the roof, and consequently to abandon the mine.

*Comerse los pilares*—The same as *comer los pilares*, figuratively, to abandon a mine.

*Compromiso*—A private engagement or undertaking; also a joint-stock undertaking.

*Conducta*—A convoy or caravan, conveying the precious metals or coin overland.

*Contra cielo*—A rise or working upwards.

*Contra mina*—A work of communication between two mines; also an adit.

*Convenio*—A legal agreement.

*Contra tiro*—Auxiliary pit contiguous to a main pit or shaft, to serve as a footway, or for ventilation.

*Copola*—A cupelling-furnace.

*Copos, or Paxillas*—In amalgamation, little globules into which the quicksilver forms, when the process is too quick.

*Coral*—Copper.

*Cortar Pilar*—To complete the pillar, and make a cross passage, and to form a landing-place.

*Cortar las sogas*—To abandon a mine; lit. to cut the ropes.

*Costadores*—Wood-cutters.

*Costal*—Sack for ore, made of the *pita* or thread of the aloe; a rammer or beetle.

*Cras*—An iron cage or frame used in smelting.

*Creston*—Out-cropping of a lode; the crest of a lode appearing above the surface of the ground.

*Criadero*—A spot which is metalliferous; a spot; a district; a mountain; a rock where ores are supposed to grow.

*Criba*—Perforated leather, through which the stamped ore falls into a pit.

*Crisolito*—Chrysolite.

*Cristal*—Crystal.

*Cristal de roca*—Rock crystal.

*Crucero*—A cross-cut.

*Cruces*—The cross-pieces of the arrastres, or grinding-mills.

*Cruzada*—Applied to lodes, that which is crossed by another.

*Cubo*—A leather or other bucket.

*Cuchara*—The scraper used for extracting the pulverized ore or rock in the hole made to receive the charge for blasting; a spoon.

*Cuchara de cuerno*—A small horn bowl in which the earth of the tortas is washed, in order to ascertain from time to time the progress of the amalgamation.

*Cuele*—The art or effect of cutting or driving a mine; work in any direction; the distance or space advanced in a mining work.

*Cuerda*—A rope.

*Cueros*—Skins, generally of oxen, cows, &c.

*Cuna*—A wedge.

*Curtir*—The operation of adding lime to warm ores, or magistral to cold ores in amalgamation.

*Cuerpo*—The lode ; also body, as *cuerpo de la veta*, body, or main vein of the lode.

*Cuerpo alto*—Upper branch of the lode ; upper story of a house or store.

*Cuerpo baxo*—Lower branch of ditto ; ground-floor of ditto.

*Cuerpo medio*—Middle branch of ditto.

These three terms are used where a lode is divided into three parallel branches with the same underlay, as at Veta Grande, Guanajuato.

*Dedo*—The 12th part of a palmo ; 4 palmos making 1 vara—12 dedos—8 pulgadas, or Spanish inches.

*Demasia*—Space unappropriated between mines, or otherwise.

*Denuncio*—*Denunciacion*—Denouncement ; a formal application to the court of mines of the district, to have a mine adjudged to the applicant, the workings of which have been abandoned, or inefficiently carried on during the period fixed by the ordinance, or which has never been worked at all. A person has the power of denouncing a mine which has been unworked, or inefficiently worked, or depopulated for more than four months.

*Deputacion de mineria*—Mining tribunal.

*Derecho*—Straight, right.

*Derrumbe, or Derrumbamiento*—The falling in of the works of a mine.

*Desaguator*—Water-pipe or conduit.

*Desagüe*—Drainage.

*Desagües*—Outlets of every description by which the water is got rid of.

*Descargue*—Drawing off the last contents of the furnace, blowing out the furnace.

*Descostradores*—Men employed in taking down any fragment which may remain after blasting.

*Descubridora (mina)*—The mine in which the vein has been discovered, and which is entitled by law to a double *pertenencia* if in a district already worked, or a treble *pertenencia* if in a new district.

*Desfrutar*—To enjoy, to have the benefit of a mine.

*Desmonte*—Clearing away the surface of the ground ; removing by the pick, blasting, or otherwise, the mountain rock, or breaking down ores.

*Despacho*—Plat ; point of junction between a shaft and a level enlarged for receiving the ores, &c. to be sent up the shaft to the surface.

*Despachadores*—Men employed in filling the *mantas* with ores, &c.

*Despensa*—A store-room for materials and tools, sometimes also for the quicksilver, and even for the bullion.

*Despueble*—Abandoning the mine, or omitting to keep the proper number of hands at work.

*Destajo*—Piece or contract work ; tut-work.

*Destajero*—Tut workman, or one who undertakes to work by contract.

*Diamante*—Diamond.

*Dique*—A dyke.

*Echadero*—A plain where mules are loaded, the metal spread out, cleaned, and weighed.

*Echado*—Inclination, or dip of the slope.

*Eje*—The axis of a wheel, axis of a carriage, &c.

*Embolo*—A piston.

*Emborrascarse*—Applied to a vein which has become barren as the spot then in work.



- Emparejar*—To level or square ; to harness cattle, saddle them.
- Empleo*—The quantity of quicksilver mixed with the ore on any given occasion for effecting the amalgamation.
- En bonanza*—Yielding profitable returns.
- Encampanar una mina*—To cut off the workings of a mine on the underlay by working on the lowest works from the neighbouring mine.
- Encapillar*—To form a chamber, or an enlargement of a working, preparatory to driving another work from it.
- En frutos*—In produce, producing ores.
- Ensalmorar*—The first process in amalgamation, the act of mixing the saltierra with the lama.
- Ensayador*—Assayer.
- Ensaye*—An assay.
- Ensayo*—A trial.
- Escaleras*—Ladders made of poles of timber, with notches cut in them, or otherwise.
- Esmanil*—Blende.
- Esmeralda*—Emerald.
- Esmeril*—Emery.
- Espato*—Spar.
- Espato calizo*—Calcareous spar.
- Espato fluor*—Fluor spar.
- Espato pesado*—Heavy spar ; sulphate of lime.
- Espejuelo*—Mica.
- Espeque*—The cross-level of the noria or tahona to which the mules are harnessed ; a lever.
- Estaca fija*—The post driven into the ground, from which the pertenencia is originally measured. *Estaca* means a stake.
- Estado*—A statement or account.
- Estano*—Tin.
- Estanque*—Pond, dam of water.
- Estoraque*—Brown blende, sulphuretted zinc.
- Faenas*—Work done by common labourers, such as dead-work, removing rubbish, &c.
- Faenero*—Rubbish-carrier.
- Fanega*—A dry measure, containing 12 celamines, or 1·599 of an English bushel.
- Fanegado*—An extent of land ;  $90\frac{1}{2}$  fenegados are equal to 100 English acres.
- Feldespató*—Feldspar.
- Fierros*—Stein, vulgarly regulus, from the smelting-furnace.
- Flete*—Freight.
- Fluorspató*—Fluor spar.
- Fluxo*—Flux.
- Fondon*—A furnace for smelting ores.
- Fosforo*—Phosphorus.
- Fosiles*—Fossils.
- Fragua*—A forge.
- Frios*—In amalgamation, cold ores, those containing calcareous matter, therefore requiring a larger quantity of sulphuric acid from the magistral.
- Frente*—An end ; a forehead ; an extremity of an adit or other level.

*Frijolillo*—A breccia.

*Frixoles*—French beans, the common food of the country.

*Frutos*—Produce, ore.

*Fuelles*—Bellows.

*Fundidor*—A founder, a smelter.

*Fundicion*—Smelting; also, the smelting-house.

*Galena*—Galena, sulphuret of lead.

*Galera*—A large shed, a mill-house, or grinding-mill; a large building on the floor of which the treading-in of the quicksilver in amalgamation takes place.

*Galleria*—A gallery; a level.

*Gallos*—Small particles of silver, which appear in the shape of spherules on the surface of certain ores, after they have been strongly heated; more generally, however, applied to the spirting out of the silver from the assay-button on cooling; also fine specimens of native silver, or other rich ores.

*Gamela*—A large wooden bowl.

*Galpeador*—A miner who works with the mallet or hammer in blasting.

*Granada*—Garnet.

*Granito*—Granite.

*Grano*—A grain.

*Granos de oro*—Grains of gold.

*Granza*—Coarse particles of ore after grinding, which require to be ground again; brayed ore.

*Granzas*—Poor ores.

*Grasas*—Slag from the smelting-furnace.

*Greda*—Chalk.

*Grena*—Ores in the rough state, not cleaned.

*Greta*—Litharge, fullers'-earth.

*Gualdra*—The large cross-beam in which the upper spindles of the shafts of the machinery traverse.

*Guarda*—A rib of different substance from the rock or lode, which generally is upon the sides of the vein, called in Cornwall cupels of a lode or backs.

*Guarda raya*—Marks or limits of the boring, or measurement of the work done in a mine; limit or boundary-line.

*Guia*—A mark directing to the richest part of the vein.

*Guijarro*—Pebble.

*Guijo*—The iron spindle of the shaft of machinery.

*Guixa*—Quartz.

*Hallilitador*—He who supplies money for working a mine.

*Hachas*—Axes, hatchets.

*Hacienda*—Farm; estate; establishment for reducing ores.

*Hacienda de beneficio*—Establishment for reducing ores.

*Hacienda de fundicion*—Establishment for smelting ores.

*Haciendero*—The superintendent of the hacienda.

*Hechado*—Dip of the lode.

*Herramienta*—Tools; taken figuratively, it implies a borer and hammer-man.

*Hierro*—Iron.

*Hierro colado*—Cast-iron.

*Hierro labrado*—Wrought iron.

- Hilo*—A small vein or thread of ore in a lode.  
*Hilo de la veta*—Line or direction of the vein.  
*Hilos altos*—Threads or small veins of ore falling into or proceeding from the upper or hanging wall of a lode.  
*Hilos bajos*—Threads or small veins of ore proceeding from or falling into the lower wall of a lode.  
*Hoja de lata*—Tin-plate.  
*Hoja de laton*.—Sheet-brass.  
*Hoja de libro*—Finely laminated clay ; talc ; lit. leaf of a book.  
*Horno*—A furnace.  
*Horno de fundicion*—A smelting-furnace.  
*Horno de magistral*—Roasting-stove for copper stove.  
*Huaco*—A hollow.  
*Hueco*—A hollow place.  
*Huembas*—Small rough beams of buildings.  
*Hundido*—Sunk in ; workings which have fallen in.  
*Incorporar*—In amalgamation, to add the first charge of quicksilver. The term *cebar* is applied to the adding the subsequent charges ; it also means the act of mixing in thoroughly the whole of the quicksilver, with the torta of wet ore.  
*Ingenios*—Engines.  
*Instrumentos*—Instruments, tools.  
*Intendente*—Intendant.  
*Interventor*—Inspector, representing the interest of the proprietors by whom appointed, or of the *aviador*.  
*Irido*—Iridium.  
*Jantilla*—A double-handed ladle into which the melted silver falls from the cras.  
*Jaspe*—Jasper.  
*Jornaleros*—Day labourers.  
*Jorongo*—A small basket ; also a blanket.  
*Labor*—A work from which ores are extracted ; in general, all work of the mine, and especially the front work.  
*Labores de hacienda*—All workings in a mine not let to tributors.  
*Ladrillera*—An iron or stone mould in which the melted silver is poured in order to form the barra.  
*Ladrillos*—Bricks.  
*Lama*—Slime or schlem from the amalgamation.  
*Lamero*—The lama when merely thickened by admixture with saltierra.  
*Lameros*—Lama-pits.  
*Lancha*—A sort of hard freestone.  
*Lapiz*—Black lead.  
*Lapiz encarmado*—Red chalk.  
*Laton*—Brass.  
*Lava*—Lava.  
*Lavador*—A man employed in washing the ore after amalgamation, or rather, in cleansing the amalgam.  
*Lavaderos*—Gold-washings ; washing vats or tubs for separating the amalgam from the lama or slime.  
*Lazadores*—Men who procure people to work in the mine ; also men employed to catch cattle.  
*Lena*—Fire-wood.

- Lenadores*—The workmen employed to carry and serve the wood in the smelting-furnace ; also, the wood-cutter ; collectors and sellers of fire-wood.
- Lenter nillas*—Large vertical wheels of the stamping apparatus.
- Ley*—Standard of the metals ; contents in pure silver.
- Ley de oro*—Quantity of gold contained in the silver.
- Ley de plata*—Quantity of silver contained in the ore.
- Libramiento*—Warrant for payment for bars of gold or silver delivered at the mint, or order for funds.
- Libranza*—A bill of exchange.
- Liga*—Flux.
- Limadura*—An appearance put on by the quicksilver in certain stages of the process of amalgamation, which is noticed at the edges of the amalgam, washed in the bowl for making a *tentadura*, or trial.
- Limpia*—Clearing out of rubbish and ruins from the old work in a mine.
- Lis*—A particular state of the amalgam observed by means of the *tentaduras*, or trials, in the bowl.
- Llano*—A plain, flat ground.
- Llevada*—Carriage ; transport.
- Llevador*—Carrier, conductor.
- Lodo*—Mud.
- Losa*—A flat stone.
- Lumbrera*—An air-shaft ; an adit-shaft.
- Macero*—He who has the charge and direction of crushing and grinding the ore in the tahonas, previous to amalgamation.
- Macizo*—A solid untouched part of the vein.
- Madera*—Timber.
- Maestro herrero*—Master blacksmith.
- Maestro carpintero*—Master carpenter.
- Magistral*—Copper pyrites, used in amalgamation.
- Malacate*—A horse-whim.
- Malacatero*—A whim driver.
- Malacate doble, or Malacate sencillo*—The former whim has bags made of two ox-hides, holding 1,250 lbs. of water ; the latter one hide, and holding half the quantity.
- Maiz*—Indian corn, the principal food used at the mines.
- Manantial*—A spring of water.
- Mandadero*—Errand-boy.
- Mandon*—Master miner or overseer.
- Manga*—Level divided for ventilation ; air-pipes ; a bag or strainer used to separate the quicksilver from the *pella*.
- Manganesa*—Manganese.
- Manta*—A blanket or horse-cloth, used to contain ores or tools to be brought up by the malacates, now replaced generally by sacks made of the fibres of the agave, or ox-hides.
- Mantear*—To raise ores from the shaft in bags or mantas.
- Manto*—A bed or circumscribed stratum.
- Maquina*—A machine.
- Maquinas de vapor*—Steam-engines.
- Maquila*—Rate paid to the proprietor of a mill, or reduction-work, for reducing ore on another party's account ; applied chiefly to reduction by amalgamation.



- Maquilero*—One who dresses ores on hire.
- Marco*—8 ounces or lb. Spanish, equal to 3,552 grains English.
- Marco de oro*—8 ounces of gold.
- Marco de plata*—8 ounces of silver. The marco de oro, or marco de plata may be standard, or otherwise.
- Marmol*—Marble.
- Maroma*—A rope to pull or draw by as a hawser.
- Marquesitas*—Mundic ; iron pyrites.
- Martillo*—A hammer.
- Martriquila*—A registry for miners, &c.
- Maza*—Stamp-head for pounding the ores.
- Mecha*—A match or fuze.
- Medida*—A measure.
- Mejora*—Improvement.
- Mejora de boca*—A term used when an improvement or alteration is made in the entrance to a mine.
- Memoria*—Weekly account of disbursements or mine expenses.
- Mercurio*—Quicksilver.
- Merma*—Loss of quicksilver in amalgamation or of lead in smelting.
- Meson*—An inn mostly appropriated to muleteers, &c.
- Metal*—Metal, ore.
- Metal de ayuda*—Metal or ores added in smelting, to assist in the reduction of the silver ores ; lead, or galena, for example.
- Metal pepena*—Selected and picked gold and silver ores.
- Metales communes*—Common ores.
- Metales de fundicion*—Ores for smelting.
- Metales plomosos*—Ores impregnated with lead.
- Metales porosos*—Porous ores.
- Metapiles*—Grindstones used in the tahonas ; also pigs of copper used in the hot amalgamation.
- Mexquite*—Robinia, or acacia ; a wood much used in mines.
- Mineral*—Ore ; mineral ; recently applied to a mining district, formerly and still called Real de Minas.
- Mineria, diputacion de*—A tribunal cognizant of mining matters, elected in most cases by the mine-owners of the district.
- Minero*—A miner, an underground agent.
- Minio*—Red lead.
- Modelos*—Models.
- Mojon*—A landmark, used to mark the limits of pertenencias.
- Molibdena*—Molybdena.
- Molienda*—The act of grinding or pounding the ores, sometimes used to designate the ores ground, "*La Molienda*."
- Molinete*—Shaft of tina.
- Molino, or Mortero*—Stamping-mill.
- Molonques*—Crystallization of silver ores ; very rich.
- Montana*—A mountain.
- Montes*—Woods.
- Monton*—A heap of ore ; a batch under the process of amalgamation, varying in different mining districts. At Catorce, 36 quintals ; at Guanaxuato, 35 quintals ; at Real del Monte, Pachuca, Sultepec, and Tascas, 30 quintals ; Zacatecas and Sombrerete, 20 ; Fresnillo, 18 ; Bolanos, 15 ; and at Valenciana, 32.

- Mozo*—A man-servant.  
*Muestras*—Samples.  
*Mufla*—A tuyere.  
*Natas o Escorias*—Slags.  
*Natron*—Native carbonate of soda.  
*Negociacion*—Business, undertaking; as a mine, or set of mines, &c.  
*Nicolo*—Nickel.  
*Nitro*—Nitre.  
*Nivel*—Level.  
*Niveles de agua*—Water-levels.  
*Noria*—An endless chain with buckets attached, revolving round a wheel; it is used underground for drawing water out of the pozos or sinks, which are carried down to a greater depth than the principal shaft; also, a common superficial machine for raising water.  
*Obras*—Workings.  
*Ocre*—Ochre.  
*Ocre rojo, or Ocre colorado*—Red ochre.  
*Official de carpintero*—Journeyman carpenter.  
*Official de Albanil*—Journeyman bricklayer.  
*Ojo*—Bunch or small spot of ore in a lode.  
*Ojo de polvilla*—Spots of rich ore.  
*Ojo de vibora*—Black sulphuret of zinc.  
*Onique*—Onyx.  
*Opalo*—Opal.  
*Operanos*—Workmen.  
*Ordenanzas de mineria*—Code of mining laws.  
*Oro*—Gold.  
*Oro de copela*—Fine gold.  
*Oro empolvado*—Gold dust.  
*Orphimento, or Oripomente*—Orpiment.  
*Pacos*—Earthy ores, consisting of oxide of iron mixed with various ores of silver; when of a red colour they are frequently called *colcorados*; they are generally found near the surface.  
*Paja*—Straw.  
*Pala*—A wooden shovel.  
*Paldion*—Palladium.  
*Palanca*—A lever, a pole on which a weight is supported by two men.  
*Palansa de hierro*—Crowbar.  
*Palmo*—Quarter of a vara or Spanish yard.  
*Panino*—The ground or country through which the lode runs; also, the matrix.  
*Panizo*—Hornstone.  
*Parada*—A relief or change of men, mules, or horses.  
*Parcionero*—A partner in the mines.  
*Parihuela*—A letter.  
*Partido*—Division of ores between the owners and buscones.  
*Pasta*—Uncoined silver.  
*Patio*—A yard, court; floor of a court on which the ores pass through the process of amalgamation.  
*Patio de amalgamacion*—Amalgamation court.  
*Pegador*—Man who sets fire to the matches for blasting.  
*Pella*—The silver mixed with quicksilver when all the latter metal has

- been forcibly pressed out, except the portion which can only be separated by distillation.
- Peltre*—Pewter.
- Peones*—Native labourers or assistants; day labourers.
- Pepena*—Picked ore of the best quality; rich ore.
- Pepenado*—Cleaned ores.
- Pepenadores*—Cobbers, cleaners, and classers of the ores.
- Pepitas*—Small grains of native silver or gold.
- Peritos*—Intelligent or practical persons selected as arbitrators to decide scientific or practical questions or disputes, or to determine the underlay of veins prior to fixing the limits of the *pertenencias*.
- Perla margarita*—Pearl.
- Pertenencia*—Extent of 200 varas upon the course of a lode, to which a title is acquired by denunciation; the breadth varies according to the underlay of the vein, from 112½ varas to 200 varas.
- Peso*—A dollar; any weight.
- Petlanques*—Crystallizations of silver ores; also, silver ores which are very conspicuous in the matrix; for example, petlanque colorado is the red antimonial silver, whether crystallized or otherwise.
- Pez*—Pitch.
- Pico*—A miner's pick.
- Piedra*—Stone.
- Piedra de toque*—Touchstone.
- Piedra cornea*—Hornstone.
- Piedra iman*—Loadstone.
- Piedra podrida*—Rottenstone.
- Piedra pomez*—Pumice-stone.
- Piedras de mano*—Good pieces of ore, sometimes carried up by hand, and often assigned to pious purposes.
- Piedras preciosas*—Precious stones.
- Pilares, or pilarejas*—The pillars of a mine.
- Pileta*—A trough; the hollow basin before the smelting-furnace into which the metal flows; tank or small reservoir underground to collect the water of infiltration.
- Pina*—The cake of silver left after the quicksilver has been distilled off.
- Pinta*—The appearance, whether favourable or unfavourable, of a fragment detached from the lode; the mark of particular metals by which their value is recognised according to their appearance to the eye.
- Pintra*—To exhibit pintas, or indications of ores.
- Pirites*—Sulphuret of iron.
- Piso*—The bottom or floor of a work.
- Pison*—A rammer.
- Pita*—Thread made of the fibre of the agave or maguey.
- Pizarra*—Slate.
- Plan*—A bottom working, or working driven from the bottom of a level, adit, &c.
- Plancha*—Pigs, as *plancha de plomo*, pigs of lead.
- Plata*—Silver.
- Plata de ley*—Standard silver.
- Plata pina*—Silver after distilling off the mercury.
- Plata parda azule y verde*—Muriate of silver of different colours.

- Pleito*—A lawsuit.
- Platina*—Platinum.
- Plomo*—Lead.
- Plomosos*—Applied to ores containing lead.
- Poblar*—To set on workmen in any mine.
- Polvillones*—Rich ores.
- Polvillos*—Applied to ores, tender, rich.
- Polvillos buenos*—Good ores of the kind.
- Polvo*—Dust.
- Polvora*—Gunpowder.
- Polvorilla*—Black silver, disseminated sulphuret of silver.
- Porfido*—Porphyry.
- Potasa*—Potash.
- Pozo*—A sink on the inclination of the vein ; a pit, a well.
- Presa*—A dam.
- Protocolo*—Minutes.
- Pueblo*—Actual labour in the mine, with the number of workmen at least prescribed by the mining laws.
- Puertas*—Very strong rock, which conceals the vein, and which requires blasting ere the vein is discovered ; also doors.
- Pulgada*—An inch.
- Quadrado*—A square.
- Quajado*—Dull lead ore.
- Quarzo*—Quartz.
- Quebrado*—A ravine.
- Quebradores*—Cobbers or breakers of the ores ; men who break up the ores on the surface.
- Quemadero*—Burning house or place.
- Quemazon*—The barren scorched appearance of the crest of a metalliferous lode protruding from the surface of the mountain.
- Quilate*—Synonymous with carat ; for example, gold of 22 quilates contains 22-24th parts of pure gold, just as the English standard gold of 22-24th parts of pure gold. The quilate is divided into 4 granos Spanish.
- Quintal*—4 arrobas or 100 lbs. Spanish, equal to 101 45-100 lbs. English.
- Quita pepena*—A man who stands at the mouth of the shaft to see that none of the metal is stolen.
- Ramo*—A branch from the main vein.
- Rancho*—A detached farm-house and ground ; the house is often nothing more than a hut.
- Raya*—Weekly account of the mine expenses.
- Rayador*—Clerk who keeps account of the workmen's time, the stores received, &c.
- Real*—1-8th of a dollar ; a mining district.
- Real de minas*—The term generally applied to a mining district ; although Mineral de Minas is also now used.
- Reata*—A rope about as thick as a finger, or larger, used as lashings to *cargas*.
- Reatilla*—A single twisted smaller rope.
- Rebaxe*—A working down of high ground.
- Rebolltura*—A mixture of the ground ore with the usual re-agents or fluxes.



- Rebosadero*—Crest of a vein.  
*Recina*—Rosin.  
*Recuesto*—Inclination of a vein.  
*Regador*—One who has a right to a certain share of water for irrigation.  
*Registrar*—To get an entry made by the proper officer of a party taking possession of a new mine.  
*Registro*—An entry as above described.  
*Reliz*—The wall of the vein.  
*Remolino*—Mass or bunch of ore.  
*Rendirse*—In amalgamation said of a torta when the amalgamation is complete.  
*Repasar*—The mixing together of the ore, quicksilver, and other ingredients in the wet state, in order to extract the metal; to work the quicksilver into the tortas of ore under amalgamation, done by treading them with mules or men.  
*Repasador*—Labourer who treads the quicksilver into the ores under amalgamation.  
*Rescatador*—Ore purchaser.  
*Rescate*—Public sale of ores.  
*Retortas*—Retorts.  
*Riscos*—Crystals.  
*Rosicler*—Ruby silver; red antimonial ore.  
*Rio*—A river.  
*Rubi*—Ruby.  
*Ruedas*—Wheels.  
*Rumbo*—Point of the magnetic compass.  
*Rumbo de la veta*—Line or direction of the vein.  
*Saca*—The ore obtained from a mine in a given space of time.  
*Sacabocados*—Punches.  
*Sacabuches*—Hand-pumps.  
*Sal*—Salt.  
*Sala*—The principal room of a hacienda, or any other building.  
*Salitre*—Saltpetre.  
*Sal mineral*—Mineral salt for amalgamation.  
*Sal tierra*—Impure or earthy salt.  
*Salineros*—Applied to ores requiring much salt in amalgamation.  
*Salones*—Saloons, large halls, hollows, or cavities in a lode.  
*Sangria*—Letting off water by piercing the rock or other substance which dammed it in.  
*Sanguinaria*—Bloodstone.  
*Scrape*—Blanket, the usual dress of miners.  
*Sebo*—Tallow or suet used for machinery, &c.  
*Sierras*—Saws; chains of mountains.  
*Silla*—A saddle; a leather which passes over the men's shoulders to protect them in carrying the ore.  
*Sitio de labor*—Land-measure, 5,000 varas in diameter.  
*Sobrante*—Surplus, profit, residue.  
*Socabon*—An adit or water-level driven from the earth's surface, either on the course of a lode, or to intersect it.  
*Soga*—The rope to which the bota is attached.  
*Soguilla*—The rope for the botillas de burro, botas chicas, or mantas.  
*Soldadura*—Solder.

*Soliman*—Corrosive sublimate.

*Sombra*—Shade ; grey tinge of certain ores or matrices of ores.

*Soto minero*—Sub-miner.

*Soplete*—A blow-pipe.

*Sucino*—Amber.

*Tablas*—Planks.

*Tahona*—A mill of small horizontal stones.

*Tajadera*—Wedge to break the tinas.

*Tajo*—A cut.

*Tajo abierto*—An open cut.

*Talco*—Talc.

*Talega*—Bags of dollars containing 1,000.

*Tanda*—Task ; compulsory labour ; days appointed for working the mine ; duration of the period in which a regador is entitled to use running water for irrigation.

*Tanque*—Tank or artificial pond.

*Tantalio*—Tantalum.

*Tapa ojos*—Bandage for the eyes ; used to cover the eyes of mules when treading the ore in the patio or elsewhere.

*Tarea*—A task ; also a certain quantity of wood for fuel ; the quantity cut upon one task.

*Tejamanil*—Shingle for roofing.

*Tejo*—Cake of metal.

*Tellurio*—Tellurium.

*Tenates*—Sacks made of pita, or hide, for raising the ore on men's shoulders ; large leather or coarse linen bags, in which the tenateros remove the ores and rubbish.

*Tenatero*—Ore-carrier from the workings to the surface, or to the despacho only.

*Tentadura*—An assay or trial.

*Tepetate*—Rubbish remaining after cleaning the ores ; also applied to all the earth of the mine which contains no metal ; barren rock through which the ore runs.

*Terquesite*—Native carbonate of soda.

*Terreros*—Heaps of attle and rubbish from the mine.

*Tersoreria*—Treasury.

*Testera*—A dyke interrupting the course of a lode.

*Texear bien en horno*—When the litharge is thrown out from the furnace.

*Tienda de raya*—A shop at which the miners obtain weekly credit.

*Tierra pesada*—Barytes.

*Tierras*—Earths, applied to ores, earthy poor.

*Tierras apolvillados*—Ores a degree inferior to azogues apolvillados.

*Tierras communes*—Common earthy ores.

*Tierras de morlero*—Poor stamped ores.

*Tina*—A vat or jar.

*Tiro*—A shaft.

*Tiro de mulas*—A set of mules.

*Tiro general*—The principal shaft.

*Titanio*—Titanium.

*Tornero*—A wooden vat.

*Torta*—A certain quantity of ore under amalgamation forming one heap, which, being of a flat shape, is called a torta or cake.

- Torta rendida*—Amalgam ready to undergo the washing operation.  
*Trementina*—Turpentine.  
*Triangulos*—The cogs of the stamps.  
*Tribunal de minera*—Mining tribunal.  
*Trompeto*—A small malachite.  
*Tungstena*—Tungsten.  
*Turba*—Turf, peat.  
*Turbit mineral*—Yellow oxide, or sulphuret of mercury.  
*Uranio*—Uranium.  
*Vapor*—Steam ; foul air in a mine.  
*Vara*—A Spanish yard, equal to 33 inches English nearly, 109 30-100th varas, equal to 100 English yards.  
*Velas*—Candles.  
*Velador*—A watchman who takes care of the mine day and night ; an under-miner.  
*Vena or veta*—A vein or lode ; it is called *manta* (a cloak), when it is a bed ; *clavada* (upright), when it is vertical or nearly so ; *echada* (inclined), when it has a certain dip or inclination ; *obliqua* (oblique), when it goes in that direction through the mountain ; *serpenteada*, when in a serpentine direction ; *socia* (companion), when it is joined with another ; *rama* (branch), when it proceeds from the main vein.  
*Verde tiero*—Verditer.  
*Vermellon*—Vermilion.  
*Veta madre*—The mother or principal vein.  
*Vidrio*—Glass.  
*Vigas*—Beams, split or sawed timber.  
*Vitriolo*—Vitriol.  
*Vitriolo azul*—Blue vitriol.  
*Vitriolo blanco*—White vitriol.  
*Vitriolo verde*—Green vitriol or copperas.  
*Voladoras*—Grinding-stones of the arrastres.  
*Vuelta*—The glow of the silver in cupellation when the last film of oxide of lead suddenly separates and disappears.  
*Xabon*—Soap ; a peculiar description of ores.  
*Xabones buenos*—Good ores of the above description.  
*Xacal*—A hut in which ores and tools are kept.  
*Yasca*—Tinder or touchwood.  
*Yeso*—Sulphuret of lime.  
*Yunque*—Anvil.  
*Zacate*—Maize straw or grass given to the mules.  
*Zanca*—A ditch.  
*Zurron*—A sack made of leather ; cochineal is packed *Zurrones*.

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## FRENCH, SPANISH, AND GERMAN SMELTING TERMS.

CONTRACTIONS.—Fr. *French* ; Sp. *Spanish* ; Gm. *German*. Cp. Copper ; Sl. Silver ; Ld. Lead ; Tn. Tin ; Ir. Iron.

- Abzug*—Gm. sl. ; sulphurated litharge dross, in silver refining.  
*Abstrich*—Gm. sl. ; impure brown litharge, in silver refining.

- Arastre*—Sp. sl. ; crushing-mill.  
*Autel*—Fr. ; the fire-bridge of the air-furnace.  
*Aspirateur (fourneau)*—Fr. ; air or wind furnace.  
*Affinerie*—Fr. ; refining metals.  
*Blicksilber*—Gm. sl. ; crude silver, from silvery lead, not quite fine.  
*Brandsilber*—Gm. sl. ; refined silver, from silvery lead.  
*Bleistein*—Gm. ld. ; regule from coppery (&c.) lead ores.  
*Brasque*—Fr. ; lining of close-beaten charcoal.  
*Battitures*—Fr. ; forge-scales of oxide of iron.  
*Cingler, Cinglage*—Fr. ir. ; shingling.  
*Crasses*—Fr. ; clots, dross.  
*Castine*—Fr. ir. ; limestone.  
*Carcasses*—Fr. sl. ; coppery residues of liquiation for silver.  
*Cuivre en grains*—Fr. cp. ; beanshot copper.  
*Cuivre en plumes*—Fr. cp. ; feathershot copper.  
*Cuivre noir*—Fr. cp. ; coarse copper for refining.  
*Cuivre ampoulé*—Fr. cp. ; crude copper ready for refining, called "pimple copper."  
*Chemise*—Fr. ; lining of a furnace.  
*Capelline*—Sp. sl. ; the iron bell under which the silver amalgam is distilled downward.—See *Pina*.  
*Creuset*—Fr. ; crucible ; receiving-pit of a furnace.  
*Cadmies*—Fr. ; metallic soot ; sublimate.  
*Centner*—Gm. ; proportionate weight of 100, whether pounds, ounces, loths, or grains.—See *Loth*.  
*Darrlinge*—Gm. sl. ; copper residue from silvery copper, sweated out by lead.  
*Decrassage*—Fr. ; skimming, cleaning.  
*Dame*—Fr. ir. ; the front hearth-stopper of the high blast furnace.  
*Dunnstein*—Gm. cp. ; poor copper regule.  
*Erzmehle*—Gm. ; ground ore.  
*Etain en larmes*—Fr. ; grain tin.  
*Eclair*—Fr. ; the "brightening" of fine silver in cupellation.  
*Frischstuck*—Gm. sl. ; silvery lead eliquiated from silvery copper ore.  
*Fonte*—Fr. ; cast metal ; generally cast iron.  
*Fraisil*—Fr. ; broken small charcoal.  
*Fourneau à manche*—Fr. ; low blast furnace.  
*Floss-öfen*—Gm. ir. ; the high blast furnace.  
*Foyer*—Fr. ; fire-hearth of a furnace ; focus.  
*Fonte crue*—Fr. ; fusion of regule from raw ore.  
*Fällung*—Gm. ; precipitation in watery solution.  
*Gahrkupfer*—Gm. ; refined copper.  
*Gahrschlag*—Gm. ; refinery slag.  
*Gahrproof*—Gm. ; refining test.  
*Gahrspan*—Gm. ; the refining assay sample.  
*Gahreisen*—Gm. ; the iron rod for drawing the sample.  
*Gahrost*—Gm. ; the copper after the last roasting.  
*Gift Mehl*—Gm. ; arsenic soot.  
*Hütte*—Gm. ; foundry ; kiln ; smelting-furnace.  
*Hüttenwerke*—Gm. ; smelting-house.  
*Heller*—Gm. ; a weight ;  $\frac{1}{4}$  pfennige ; about 7 grs. impl.—See *Pfennige*.  
*Houille grasse*—Fr. ; bituminous coal.



- Houille sèche*—Fr. ; coal little or not bituminous.
- Kupferstein*—Gm. ; regule from coppery lead ores, twice roasted.
- Kupferleg*—Gm. ; regule from bleistein, roasted with quartz copper ores, &c.—See *Bleistein*.
- Krummofen*—Gm. ; low blast furnace.
- Kornig*—Gm. ; grainy, as *grob-kornig*, coarse-grained.
- Loupe*—Fr. ir. ; the ball or bloom from the puddling furnace.
- Lama*—Sp. sl. ; fine ground ore, ore mud.
- Loth*—Gm. ; a standard weight about  $\frac{1}{2}$  ounce impl.
- Laitiers*—Fr. ; fusible slags.
- Lingotière*—Fr. ; ingot mould.
- Monteros*—Sp. sl. ; stampers.
- Monton*—Sp. sl. ; small heaps of ore mud, for amalgamation.
- Magistral*—Sp. sl. ; roasted copper ore, for mixing in the amalgam heap.
- Matte*—Fr. ; regule, melted sulphuret.
- Minéral*—Fr. ; ore.
- Neiderschlag*—Gm. ; precipitate.
- Noyer*—Fr. sl. ; the assay being covered with unabsorbed litharge.
- Offenbruch*—Gm. ; metallic soot or sublimate.
- Plom d'œuvre*—Fr. sl. ; silvery lead for refining.
- Poussée*—Fr. sl. ; fusion with nitre, to scorify the copper, &c., and leave the silver.
- Pina*—Sp. sl. ; piles of amalgam for distilling down the mercury.
- Patio*—Sp. sl. ; amalgamation-floor.
- Plata pina*—Sp. sl. ; the porous silver cakes left after distilling down the mercury.
- Pocherz*—Gm. ; poor ore.
- Pfennige*—Gm. ; a weight, 1-16th loth.—See *Loth*.
- Paillasse*—Fr. ; the bed of a furnace.
- Quintal métrique*—Fr. ; 100 kilogrammes, nearly 217 imperial pounds.
- Quintlein*—Gm. ; a weight,  $\frac{1}{4}$  loth, or 1-16th ounce.—See *Loth*.
- Rohstein*—Gm. ; copper regule, first fusion.
- Rable*—Fr. ; rabble ; a toothless iron rake, for skimming, &c.
- Ressuage*—Fr. sl. ; sweating out the lead for eliquiating the silver from silvery copper, &c.
- Rafrachissage*—Fr. sl. ; melting the silvery copper, &c. with lead, to extract the silver.
- Ringard*—Fr. ; iron rake for stirring melted metal.
- Rustine*—Fr. ir. ; backstone of the high furnace hearth.
- Rosette*—Fr. cp. ; refined copper, coated with bright red oxide, by plunging, hot, into water.
- Rondelle*—Fr. ; the round cake of rosette-copper.
- Rost stadeln*—Gm. ; enclosed roasting, sometimes called “case-roasting.”
- Rotissage*—Fr. ; roasting.
- Rosten*—Gm. ; roasting.
- Raffinage*—Fr. ; refining.
- Réverbère*—Fr. ; reverberatory (furnace).
- Refractaire*—Fr. ; fireproof.
- Rocher*—Fr. sl. ; the “branching” thrown out by fine silver in cooling.

- Stofferz*—Gm. ; pure ore.  
*Spleiss-ofen*—Gm. cp. ; split furnace ; refining-furnace with two receivers.  
*Spurrost*—Gm. cp. ; regule after three roastings.  
*Spurrstein*—Gm. ; the spurrost melted.  
*Speise*—Gm. ; metallic sediment from cobalt-glass, contains nickel.  
*Schlacke*—Gm. ; slag, scoria.  
*Seigerung*—Gm. ; eliquiation.  
*Speissig*—Gm. ; fibrous, as *klar speissig*, fine fibrous.  
*Stahlstein*—Gm. ; crude steel from the ore.  
*Scories*—Fr. ; metallic slags.  
*Saigerdorn*—Gm. sl. ; the coppery residue from darrlinge (which see), after sweating out most of the lead.  
*Schlackstein*—Gm. cp. ; very poor regule, chiefly iron and sulphur.  
*Saigergasse*—Gm. sl. ; eliquiation gutter, to draw off the eliquiating lead from silvery copper, &c.  
*Saltierra*—Sp. sl. ; salt earth (containing 12 or 13 per cent. salt), for mixing in the amalgamation-heap. See *Torta*.  
*Schlich*—Gm. ; fine-ground ore ; ore mud.  
*Stuckofen*—Gm. ; half-high blast furnace.  
*Schachtofen*—Gm. ir. ; high blast furnace.  
*Schlammm*—Gm. ; fine ground ore.  
*Saumons*—Fr. ; blocks of metal, especially tin.  
*Spadele*—Fr. ; shovel for turning the roasted ore.  
*Titre*—Fr. ; the proportion of precious metal in an alloy.  
*Tuyère*—Fr. ; tube, blast-pipe.  
*Trapiche*—Sp. sl. ; grinding-mill.  
*Torta*—Sp. sl. ; the great flat heap of silver ore, for amalgamation.  
*Trompe*—Fr. ; water-blowing engine.  
*Tellersilber*—Gm. sl. ; silver left from distillation of the amalgam.  
*Treibheerd*—Gm. sl. ; refining-furnace.  
*Tole*—Fr. ; sheet iron.  
*Triage*—Fr. ; sorting, picking.  
*Treibscherben*—Gm. sl. ; large compact cupells ; roasting-tests.  
*Trockene Shneidung*—Gm. ; separation by fire.  
*Usine*—Fr. ; smelting-house.  
*Verquicken*—Gm. ; amalgamation.  
*Verschlacken*—Gm. ; scorification.  
*Wismuth Graupen*—Granular bismuth, eliquiated from the ore.
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## PART III.

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### Original Papers.

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#### THE MINES OF IRELAND.

OUT of the thirty-two counties of Ireland, nineteen are reported to contain iron, seventeen copper, eighteen lead, and sixteen coal.

Deposits of the precious metals have likewise been discovered in times of remote antiquity. Ancient records inform us that during the period in which our own island was in a comparative degree of barbarity, the Irish enjoyed a greater degree of civilization than most of the nations of Europe. This may probably have arisen from their insular condition and the early introduction of Christianity. Among the earliest accounts of mining may be mentioned the chronology of the Four Masters, A.M. 3656. In this it states:—"In this year gold was first wrought by Tigernmas, King of Ireland, in the woods eastward of the Liffey; Uchadan, of the men of Cualan, was the artificer who first worked it, and by him were ornaments of gold and silver first made." The Liffey runs to a great extent through this county, entering it from that now called Wicklow, then Cualan; and O'Flaherty, in the *Ogygia*, yet more particularly states this mine to have been manufactured in that part of Cualan called Fothart, and on the eastern bank of the river Liffey; while Ballymore Eustace, a town now included in the county Kildare, stands in ancient Fothart, and on the eastern bank of that river, suggesting, not lightly, that its vicinity might have been the California of the tradition which the Irish historians preserve. The annals of the Four Masters were compiled in the early years of the seventeenth century; and it is

worthy of observation, that while they record that in A.M. 3872, King Monamon caused "collars of gold" to be manufactured for the petty kings and queens of Ireland, and the museum of the Royal Irish Academy verifies the voice of history, by the numerous gold antiques of admirable workmanship which it exhibits, and which are confidently classed as of Pagan days, and of native material and manufacture, the narrative might yet be deemed wholly apocryphal, and, perhaps, relied upon as impeaching the authority of the whole work down to the close of the eighteenth century; but then it was that in 1775 native gold was accidentally found to occur in the bed of the rivulet that descends from the northern banks of Croghan-Kinshella Mountain, south of the place which the above tradition would seem to designate, but still within the same territory of Cualan or Wicklow. This discovery led to mining operations, which were feebly conducted for several years; but neither the intelligence nor energy necessary for such undertakings was applied, so that, after several trivial attempts, they were finally abandoned, although at various periods since small particles of gold have been discovered.

In A.M. 3817, according to the same tradition, King Ennius caused silver shields to be forged at Argiodross, in the present county of Kilkenny; while another Ennius, surnamed *Derg*, "the red," is by some stated to have caused silver to be coined at the same locality, but the Masters do not adopt this latter assertion. Passing into the sixth century of the Christian era, the biography of the early saints of Ireland records, in that and the immediately succeeding centuries, various works of native art in metals, and many such are still surviving in the museum. Croziers and crosses, beautifully carved, and evidencing that they were once inlaid with gold and set with gems, vases of silver for ecclesiastical uses, reliquaries and shrines of gold and silver for bones of saints and copies of the gospel, bells and cups, gold rings and bracelets, are numerous in the same repository. In the ninth century Donatus is supposed to be the author of a "Description of Ireland," in which it is styled *insula dives opum, gemmarum, vestis, et auri*; and Nennius expressly writes of Lough Lene (the upper Lake of Killarney), that it is surrounded by four circles—the first of tin, the second of lead, the third of iron, and the fourth of copper. Modern discoveries have singularly confirmed this account also; indications of lead and of iron have been observed about the lake; and of the copper, Smith, in his "History of Kerry," says—"Few mines in Europe have produced such a quantity of copper ore as that work lately discovered at Mucruss, near Killarney, having afforded, in the year after its working, 375 tons of ore, which produces, from an ounce of the general sample, 5 dwts. 8 grs. of copper, and single pieces of pure copper have been raised there of several hundred-



weights." This valuable mine, and that at Ross Castle, adjacent, were deserted about 50 years since, as in despair ; but, on the application of steam in later days, have again proved most productive. The "Annals of Ulster" say that pearls were found in the above lake, which kings hung in their ears ; and pearls, it may be here mentioned, are also said to be found in Lough Corrib, county Galway.

In the year 1276, a silver mine in Ireland was ordered to be opened and worked, and another royal silver mine is spoken of in the year 1289, and a record of 1303 further proves that the attention of our English sovereigns was early directed to the development of the mines of this country. "One of the king's miners in Ireland," it recites, "having killed a man, his companions were afterwards beaten, and their mines filled and broken down, so as they were forced to quit them, whereupon they preferred their complaint to his majesty, who ordered a commission to inquire into the circumstances, and do them right." Thirty-one years after another commission was directed to investigate the Irish localities where mines existed ; and in 1360 certain persons were appointed to explore the mines of gold and silver in Ireland, "because," says King Edward, in the language of the writ, "it is given to us to understand, that many mines of gold and silver exist in that our land." Henry VI. projected, at the commencement of his reign, authorizing an examination of such mines here, and the assaying and smelting of the same. In 1458 the mines of Clomeen, in the county Wexford, were the subject of an Act of the Parliament of Dublin (unprinted). The State Papers, in 1543, relate a very active search for Irish mines made by Thomas Agard, under the authority of the Lord Deputy St. Leger ; and in 1546 a proposal was entertained at the council-board for effectuating their workings by an incorporation under his superintendence. "There are in Ireland," translates Holinshed from Stanihurst, "such notable quarries of marble, such store of pearl and other rich stones, such abundance of coal, such plenty of lead, iron, slate, and tin ; so many rich mines furnished with all kind of metals, as Nature seemed to have formed this country for the store-house or jewel-house of her chiefest treasure. Howbeit, she hath not showed herself so bounteous a mother in pouring forth such riches, as she proveth herself an envious step-dame, in that she instilleth in the inhabitants a drowsy litherliness to withdraw them from the insearching of her hoarded and hidden jewels." Boate, in his "Natural History," assigns another cause for the neglect of the Irish mines :—"The old English in Ireland (that is, those who are come in from the time of the first Conquest until the beginning of Queen Elizabeth's reign) have been so plagued with wars from time to time, one while intestine among themselves, and another while with the Irish,

that they could scarce ever find the opportunity of seeking for mines or metals." The same historian says, on authority that he thinks credible, that gold has been found in a rivulet called Miola, in Ulster, brought down, as he considered, from some mine in the mountain Slieve-Gallen; and the Irish newspapers of 1759 announce indications of a gold mine in Inchmore, an island of the Shannon.

Of the *silver and lead mines*, besides the tradition of the Four Masters, relating to Argiodross, it is to be noted that there is in the Vice-Treasurer's office, "An account of lead and silver made in the royal mines in the county Tipperary (of which was also preserved a description with maps), out of which the king is to have the sixth part of the lead, and the tenth of the silver, for the year to Christmas, 1638;" and another similar account for 1639, in which latter year Lord Strafford transmitted to King Charles an ingot of silver hence, which weighed 300 ounces, writing at the same time to the Lord Treasurer, that "the king's duty forth of the royal mines here will be 500*l. per annum.*" This mine was announced, in 1712, as "now brought to good perfection," and is to this day usefully and productively worked, giving the name of Silver Mines to the locality. The "Examinations of John Bealing, locksmith, touching a silver mine in Ireland," taken in 1607, and preserved in the British Museum, probably relate to this of Tipperary. Native silver has also been found in Wicklow, near the copper mines. Wakefield mentions a silver mine as once worked beside Williamstown, in the county Kildare, which seems identical with that reported in the *Dublin Chronicle* of 1787, as then at work near the Chair of Kildare. Indications of silver are said to have been also traced in the county Wexford. "There are lead and silver mines in the county Antrim," says Boate, "so very rich that every thirty pounds of lead yieldeth a pound of pure silver;" he also mentions a lead mine in Coney Island, off Sligo. In Faulkner's *Dublin Journal*, of 1784, "lead and silver mines of fair promise" were stated to exist on the estate of Henry Bond, at Derrynoose, county Armagh. Wakefield notes indications of lead at Keady, in the same county, at Dundrum and Clonlegg, in the county Down; at Ardmore, near Waterford; and near Enniscorthy, in the county Wexford. Lead ore has been found in the county Galway, near Lough Corrib, near Oughterard, on the shore of the Bay of Galway, and in the Connemara Mountains; as also at Grange-hill, in the parish of Feighcullen, county Kildare. Lead mines have been, and some are still, worked in the county Clare, at Kilbricken and Ballyhickey; the Bond and Newry mines in Monaghan; in the county Wicklow, at Glenmolaur and Glendalough; and in the county Dublin at Dunsink, at Dalkey, at Ballycorus, and in the demesne of St. Catherine's; while indications of lead were also here found at

Castleknock, Cloghran, Naul, over Clontarf town, near Crablough, and near Killiney Bay ; the last was said to contain much silver.

Of *copper mines*, those at Mucruss and Killarney have been spoken of, and other veins are said to be traceable in Crow Island and at Glanflesk, in this vicinity, as are veins of lead and copper at Miltown, in the same county (Kerry). In the elevations, called the Red Hills and Hills of Allen, in the county Kildare, a copper-work was opened in 1786. The principal bed seemed to lie deep in the hill, and even to dip under the valley that separates Dunmurrey from the Hill of Allen. Operations were, however, perhaps prematurely discontinued. The latter hill was considered to promise not less productive masses of copper. Mines of this mineral have been worked at Lisanisee, near Carrickmacross ; at Knockmahon, in Waterford ; at Dunsink and at Lough Shinney, county Dublin ; and at Glan Mountain, in Oughterard ;—while indications of copper have been noted at Ballyroan, in Queen's County ; also in the vicinity of Gort, county Galway, and at sundry localities in the counties of Cavan, Cork, Derry, Donegal, Down, and Leitrim. In 1764, "a strong course of rich copper ore" was reported as found at Cashell, near Slane, county Meath, "whence great expectations are formed, because the discovery is made in fresh ground, where the vein has no dependence on, or connection with, old workings there, which have been under water between twenty and thirty years." Last, but perhaps the most remunerative, must be mentioned the existing and thriving works of Cronebane and Ballymurtagh, with those of Cronroe and Ballygahan, in the county of Wicklow, and those of Holyford and Lackamore, in the county Tipperary.

*Iron mines* were formerly worked in the parish of Templecarne, county Donegal ; near Tallow, being the Earl of Cork's iron-works ;" at Donbilly mountain, in the county Cavan ; by the Lisban, in Tyrone ; at the foot of Slieve Gallen ; near Mount Mellick, in the King's County ; near Mount-rath, in the Queen's ; in the county Clare, six miles from Limerick ; by the side of Lough Allen, at Arigna ; and in Slieve-an-Erin, county Leitrim. Iron is also found in the counties of Kerry, Sligo, Mayo, Waterford, Wexford, and Wicklow. There are extensive beds of copper and iron on the estates of Lord Audley, in the county of Cork ; and iron-works, which were considered valuable, have been worked in the county Mayo, near Lough Corrib, uninterruptedly, until the timber of the vicinity was exhausted.

Of the *coal mines*, not the least important for consideration, various fields are said to exist, as in the county Antrim, at Murlough ; at Mount Charles, in Donegal ; at Drumquin, Drumglass, and Coal Island, in the county Tyrone ; at Petigoe, in Fermanagh ; near Carrickmacross, in Monaghan ; near Beltur-



bet, in Cavan ; near Athlone, in Westmeath ; near Slane, in the county Meath ; at and around Arigna, county Roscommon ; at Clonmore, county Mayo ; at Knockmahon Hill ; at the Naul, and near Lough Shinney, in the county Dublin. Of the latter, the petition of a Martin O'Connor, of Silver Mines, to the Irish Parliament, in 1740, and which is now extant, gives the following testimony :—"The petitioner has discovered sea coal, of the same nature as at Whitehaven, on the land of Miss Turner, and also upon the adjoining estate of Sir T. Echlin, Bart., bordering on the Channel, and within a short sail of the city of Dublin, in a district which, from the beginning of time, has stood destitute of all kind of native fuel ; whence a colliery, to be brought to perfection in a place thus circumstanced, and so favourably situated for carriage, must prove of singular advantage to the whole nation, and to the city of Dublin in a more especial manner." The Leinster coal district, in the Queen's County, the counties of Kilkenny, Carlow, and Tipperary ; and the Munster, in those of Clare, Limerick, Kerry, and Cork, are fully treated of in the various geological reports on Ireland that have from time to time appeared. In the year 1728-1729, Messrs. Benjamin Lund and Francis Hawkbee had obtained letters patent from George II. for the purpose of manufacturing copper ores, extracting of silver from copper, making of brass ; also of separating iron from ironstone, with peat, natural coal, or coal charred, and to make thereof malleable iron. In these they state :—"Whereas we purpose not only to work mines for the ores barely, but also to erect proper work-houses, with all the requisite appurtenances of various kinds, for the manufacturing of ores and minerals raised in that kingdom, and whereas a much greater advantage will accrue to that country by such manufactures being raised and carried on amongst themselves, and by their own people, than can possibly arise to them by barely working of their mines, and sending their produce to be manufactured elsewhere : Now, as we have good reason to believe that there are some people concerned in the brass and iron manufactures, who will use their utmost endeavour to frustrate this intended good undertaking, we write and publish this by way of caution to all the gentlemen and others in Ireland on whose estates mines have already been found and worked, or to such on whose estates it is probable that mines or minerals may be hereafter discovered, in order to prevent their making any unwary agreements with those, who would only purchase their ores when raised, and carry them to another place, in order to the working and manufacturing of them, or who will, by keeping such mines in suspense and unwrought, not only greatly prejudice this undertaking, but also in particular all those who are possessed of mines." This design, owing to want of sufficient capital and encouragement from the



landed proprietors of the country, was subsequently abandoned, and smelting has never been carried on with any considerable degree of success in Ireland. As, however, a greater tendency appears at present to embark capital in our home investments than in foreign enterprises, there is every reason to hope that the period is not far distant when the Irish mineral deposits will receive that attention and development which they so well merit; and by the distribution of capital that will ensue, and consequent employment of labour, cannot but be productive of great benefits to both proprietor and peasant.

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## THE ALUM TRADE AND WORKS OF ENGLAND.

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“ALUM” is often mentioned by the ancients, but it is perfectly clear that it was different to the alum of the present day. It was most probably a sulphate of iron, sometimes perhaps a sulphate of alumina, and usually a mixture of the two. Where our alum was first discovered is entirely unknown; the manufacture was first carried on in the East. About 400 or 500 years ago, there was a manufactory of it at Edessa, in Syria, at that period denominated Rocca; hence it is supposed the derivation of the term *rock alum*, extensively employed in Europe. Several alum-works existed in the neighbourhood of Constantinople. About the period of the dismemberment of the Grecian empire, the art of making alum was transported into Italy. Bartholomew Pernix, a Genoese merchant, discovered alum ore in the island of Ischia, about the year 1459; nearly at the same time, John di Casto, who was well acquainted with the alum-works in the neighbourhood of Constantinople, imagined that a mineral fit for yielding alum existed at Tolfa, because it was covered with the like trees that grew on the alum mineral near Constantinople. This conjecture was verified, and the celebrated manufactory established there. Another was established at Genoa; about the year 1544 various manufactories were established in Germany; one was erected at Commotau, in Bohemia; at the same time another was built at Alemaron, near Carthagena, in Spain.

Queen Elizabeth granted letters patent to Cornelius Devoz to mine for alum, but it was not until the latter end of her reign that Sir Thomas Chaloner, who, in his travels in Italy, examining the Pope's alum-works near Rome, and observing the mineral similar to one abounding in the neighbourhood of Guisborough, became desirous of making the attempt; but, as he was unacquainted with the process, he found it necessary to procure

workmen from the Pope's alum-works; by promises of large rewards, he induced them privately to come to England. This circumstance is said to have so exasperated the Pope, who till then had enjoyed a lucrative monopoly of the trade, that he fulminated a dreadful anathema against Sir Thomas and the workmen whom he had seduced. Fuller, in his "Worthies of England," published 1662, thus describes the discovery of alum: "This was first found out nigh Gesburgh, some sixty years since, by that worthy and learned knight, Sir Thomas Chaloner (tutor to Prince Henry), on this occasion. He discovered the leaves of trees thereabouts more deeply green than elsewhere—the oaks broad spreading, but not deep rooted, with much strength, but little sap; the earth clayish, variously coloured—here white, there yellowish, there blue, and the ways therein, in a clear night, glistening like glass—symptoms which first suggested to him the presumption of minerals and alum most properly. Yet many years interceded betwixt the discovery and the perfecting thereof—some of the gentry of the vicinage burying their estates under the earth before the alum could be brought to its true consistency. Yea, all things could not fadge with them until they had brought, not to say stolen over, three prime workmen, in hogsheads, from Rochel, whereof one Lambert Russell by name, and a Walloon by birth, not long since deceased. But when the work was ended, it was adjudged a mine royal, and came to be rented to Sir Paul Pindar, who paid yearly to the king 12,500*l.*, to the Earl of Moulgrave, 1,640*l.*, to Sir William Penneman, 600*l.*, besides salaries to numerous clerks, and daily wages to rubbishmen, rockmen, pitmen, and homemen, or firemen, so that at one time, when the mines were in their majesty, I am credibly informed, that he had no fewer than 800 in pay by sea and land; yet did not the knight complain of his bargain, who, having the sole sale of the commodity to himself, kept up the reputation thereof, and the price of alum at 26*l.* the ton. This did he the easier, because no better, and scarce other, save what from Rome and Rochel, in Europe. But the late long last parliament voted it a monopoly, and restored the benefit thereof to the former proprietaries, who now pursue the work at five several places—1. Sandsend; 2. Asholme, belonging to the Earl of Moulgrave; 3. Slapywath, Sir William (formerly Penneman's) Darcey's; 4. Dunsley, Mr. Thomas Fairfax; 5. Whitby, Sir Hugh Cholmley. Such is now the emulation between these owners to undersell one another, that the commodity has fallen to 13*l.* the ton. Great is the use hereof in physic, surgery, as a grand astringent. Besides much thereof is daily employed by clothiers, glovers, dyers; and so that some will maintain that another thing, as white and far sweeter of the two, may be better spared, with less loss to the commonwealth."

The successful prosecution of Sir Thomas Chaloner's works, induced the Darcey family to erect another alum-work at Guisborough, and in the year 1615, the works at Sandsend, about three miles from Whitby. At this period, the coal trade was first established at Whitby, and ships were built to sail from there to Sunderland and London. In the year 1649, works were erected at Saltwick by Sir Henry Cholmley and Sir Richard Crispe. These were abandoned in the year 1708, but again resumed in the year 1755 by Ralph Carr, John Cookson, Richard Ellison, and Jonas Brown, Esqrs. Another establishment the same year was commenced at Little Beck by Messrs. Howlett and Matthews. In 1764, works were commenced at Eskedaleside by Richard Jackson and John Yeoman, Esqrs., and at Little Beck by Messrs. Scarth and Thornhill. At the commencement of the present century, alum-works were established at Peak, Stroupehow, Saltwick, Little Beck, Eskedaleside, Sandsend, Kettleness, Lingberry, Boulby, and Guisborough; those at Goodlandbanks, Ayton, Carlton, Saltburn, and Osmotherly were abandoned.

When these works were all wrought, about 6,000 tons were made yearly, so that the market was greatly overstocked, and many families were ruined. About 3,000 tons were made yearly the last years of the preceding century,—the cost was then supposed to be about £14 per ton. About 400 to 500 tons were shipped direct from Whitby to foreign parts; the rest was absorbed by the London market, to be disposed of as opportunity offered. Fuller states, that a mine was worked at Woodfold, near Pleasington, in Lancashire, but had long been neglected, on account of the expense of removing the superincumbent strata. The last adventurer was Sir George Colebrooke, whose speculation in this article terminated in his ruin. Works are now still existing at Whitby, and Hurlett and Campise, in the neighbourhood of Glasgow; there are several in Sweden, in the province of West Goathland. One of the largest is at Hensäter, near the borders of the Wenern Lake, on the west side of the Kinne Kulle Mountain. According to Mr. M'Culloch, the shipments from Whitby, in 1841, amounted to 3,237 tons; the produce from Glasgow was estimated at about 1,200 tons annually. From the same authority, we learn that China is a great seat of the manufacture of alum, and that there was exported in the year 1839, 35,642 piculs (2,120 tons) from Canton. The process of reducing the alum at Tolfa is the most simple; there are several processes, but we shall give a sketch of that employed at Glasgow. The shale, which is obtained from coal-pits, having been exposed for years, has gradually opened in the direction of a slaty fracture, and the chinks in it are filled with a saline efflorescence in threads. This salt is white, with a shade of green, has a sweetish astringent taste, and consists of a mixture of sulphate of iron and sul-



phate of alumina. In order to obtain these salts in a state of solution, nothing more is requisite than to lixivate this shale with water. The lixiviated ore being left exposed to the weather, forms more salt, which is gradually washed out of it by the rain-water; and this water is collected and preserved for use. The next step is to boil down the liquid to a sufficient state of concentration. The boilers are of stone, and the heat is applied to the surface. This is a great saving, as leaden vessels are not only much more expensive but require more frequent renewal. When the liquid is raised to a sufficiently high temperature in the stone reservoir, pounded sulphate of potash, or muriate of potash, is mixed with it; there is an agitator in the vessel, by which it is continually stirred about: this addition separates the sulphate of alumina or alum. The liquid is let into another trough, and allowed to remain till it crystallizes. In this liquid there are two salts contained in solution, viz. sulphate of iron and alum; and it is an object of great consequence to separate them from each other. The principal secret consists in drawing off the mother liquor at the proper time, for the alum is much less soluble in water than iron, and therefore crystallizes first. The first crystals of alum are found very impure; they have a yellow colour, and seem partly impregnated with sulphate of iron; they are dissolved in hot water, and the solution is poured into troughs and allowed to cool a second time; these, though much purer, are not quite free from sulphate of iron, but the separation is accomplished by washing them in cold water. These second crystals are now dissolved in a quantity of water, as hot as possible, and the concentrated liquid poured, while hot, into large casks, the surfaces of which are covered by two cross-beams. As the liquor cools, a number of alum crystals form on the sides and surface. The casks are allowed to remain till the liquid within is supposed to be nearly of the temperature of the atmosphere. This in winter requires eleven days; in summer fourteen. Liquid has been known to stand in a cask eleven days in summer, at still more than blood heat. The hoops are then removed, as in the manufacture of alum from alum slate. There always remains in the boilers a residue, consisting chiefly of peroxide of iron. This is exposed to a strong heat in a reverberatory furnace, and becomes red. In this state it is washed, and yields more alum. The red residue is ground to fine powder and dried. It can then answer the same purpose as Venetian red for a pigment. By altering the temperature to which this matter is exposed, a yellow ochre is obtained instead of a red. In France, where alum-ores are not abundant, alum is manufactured from clay. This method was first put in practice by Chaptal, when professor of chemistry at Montpellier. Caraudau likewise describes a process, which is practicable and easy, but unprofitable. At Hønsäter, in Sweden,



the quantity of combustible matter in the alum slate is so great, that it is used as fuel for burning limestone. Soda alum was first mentioned by Mr. Winter, in 1810, but before that time it had been made by C. Mackintosh, Esq., of Crossbasket, and Mr. W. Wilson, Hurlet, near Glasgow.

## MINING INDUSTRY AND COINAGE OF AUSTRIA.

THE Austrian Government last year published a return of the mineral produce of the Enns, Salzburg, Illyria, Galicia, and Buckovina, during the year 1848, and of Banat and Croatia in 1847. The mountain productions of Salzburg amounted in the past year to 22,784*l.*; and consisted of 473 oz. of gold, 1,650 oz. of silver, 1,265 cwts. of copper, 639 cwts. of vitriol, 32,785 cwts. of rough iron, 2,326 cwts. of ghisa, 1,235 cwts. of sulphur, 1,031 cwts. of arsenic, 500 cwts. of cobalt ore, and 361,166 cwts. of coal. Along the Enns the mineral produce amounted in 1848 to 34,060*l.*, consisting of 1,117,195 cwts. of coal and ampelite, 720 cwts. of alum, 415 cwts. of graphite, 29,674 cwts. of raw iron, and 1,950 cwts. of ghisa. The mountain produce of Illyria, comprising Carinthia, Cragno, and the coast, amounted to the value of 281,559*l.*, and consisted of—

Gold .. ..	Marks	6½	£214
Silver .. ..	15	31	
Calamine and zinc ore ..	Cwts.	9,983	242
Quicksilver .. ..	2,884	53,814	
Lead .. ..	665,210	161,845	
Cheese .. ..	598,652	142,223	
Ghisa .. ..	22,843	9,909	
Ampelite .. ..	839,136	10,702	
Antimony .. ..	175	145	
Graphite .. ..	1,011	79	
Sulphur .. ..	40	10	
Zinc .. ..	2,833	2,125	
Alum .. ..	401	200	
Vitriol .. ..	320	20	

The mountain productions of Galicia and Buckovina, in 1848, amounted to 41,799*l.*, and consist of—

Raw iron .. ..	Cwts.	64,904	£17,058
Ghisa .. ..	22,964	10,974	
Coal .. ..	35,588	230	
Silver .. ..	Marks	468	938
Copper .. ..	Cwts.	1,861	7,448
Lead .. ..	137	137	
Litharge .. ..	561	654	
Raw Sulphur .. ..	4,902	1,735	
Purified ditto .. ..	6,382	2,625	

The mineral productions of the Banat, in 1847, were—104 marks of gold, 2,759 marks of silver, 6,222 cwts. of copper, 521 cwts. of zinc, 52,737 cwts. of raw iron, 13,277 cwts. of ghisa, 16,653 cwts. of iron in bars, 465 cwts. of copper, 2,065 cwts. of copper, and 447,686 cwts. of coal. The produce of 1848 was 2,533 $\frac{1}{8}$  marks and 4 lotti of silver, and 5,195 cwts. of copper. The quantity of other produce has not been returned. Croatia produced, in 1847, 4,164 cwts. of sulphur. The chemical establishment of Nussdorff, near Vienna, produced in 1848 6,967 cwts. of simple sulphuric acid, and 5,350 cwts. of concentrated, 1 $\frac{1}{2}$  of nitric acid, 122 cwts. of aquafortis, 46 $\frac{1}{2}$  cwts. of muriatic acid of first quality, and 81 cwts. of second quality, 40 cwts. of ammonia, and 353 cwts. of sulphate of soda—the total of the estimated value of which is 3,221*l*.

During a period of twenty-six years, from 1821 to 1847, the amount of gold produced from the Crown mines was 36,141 marks, and from private mines, 111,694 marks, making a total of 147,835 marks; the value of each mark being 366 $\frac{1}{2}$  francs, or 15*l*. 5*s*. sterling, gives an entire value of gold of 2,254,464*l*. The silver produced was 2,465,512 marks; at 24 fr., or 1*l*. each, gives the same amount sterling; of which 1,422,717*l*. were from the Crown mines, and 1,042,795*l*. from private ones. The total of gold and silver produced thus amounted to 4,719,976*l*. The amount of each year's production gradually increased during the period; for, in 1821, the amount of gold was only 3,512 marks, while, in 1847, it was 7,529 marks. Silver in 1821 was only 64,398 marks; while, in 1847, it rose to 115,681 marks.

During a period of fifty years, from 1798 to 1847, the total value of gold coined was 174,351,832 francs, or 7,264,660*l*., and silver, 439,008,000 francs, or 18,292,000*l*., making a total of 613,359,832 francs, or 25,556,660*l*. The greatest amount of gold coined in one year was 16,708,000 francs, or 696,166*l*., in 1843; and the least was 54,743 francs, or 2,281*l*., in 1801. The largest quantity of silver coined in one year was 48,873,000 florins, or (the value of a florin being estimated at 2*s*.) 4,887,300*l*. sterling, in 1843, and the lowest amount 2,311,500 florins, or 231,150*l*. The influx of foreign gold into Austria, during the twenty-six years first mentioned, was 2,000,000 florins, and silver 2,900,000; and, during that period, the total receipts had doubled, as compared to a like previous period. It appears that all the money coined does not remain in circulation; the most ancient and worn becomes recoined; some portion is employed in the manufacture of jewellery, and a considerable quantity finds its way abroad, not to return, by way of the Levant and Mediterranean, to Africa, Arabia, and Persia. The total amount of gold and silver in circulation in Austria, exclusive of Italy, is estimated at 300,000,000 francs.

## MINING IN NORWAY.

ACCORDING to the report of Mr. Sinding, Bergmester, in Norway, delivered to the Norwegian Government, and published by them in 1849, it appears that, in the year 1847, the total number of miners employed in the Norwegian copper-works were 694; the quantity of ore produced 9,399 tons; total expenditure of the mines, 55,324 dollars. During the same period, the quantity of ore smelted at the different smelting establishments (eight in number), was 10,536 tons; the quantity of copper produced, 546 tons; in the production, 17,228 lasts of charcoal, 795 fathoms of wood, and 3,065 tons of coal were consumed; the total smelting charges were 56,431 dollars. Of this quantity the Alten mines smelted  $2,225\frac{1}{2}$  tons, which gave 124 tons 1 cwt. 1 qr. fine copper;  $27\frac{1}{2}$  fathoms of wood and 3,065 tons of coal were consumed; the smelting charges were 13,426 dollars. The highest smelting charges are those of Roraas, which are 107 dollars 30 skillings per 100 barrels of ore, each containing 750 lbs.; that of Alten is 93 dollars 23 skillings for the same quantity; the lowest are those of Eidet, which are 66 dollars 10 skillings per 100 barrels. All these establishments, with the exception of the Alten, employ blast-furnaces; the operations there are conducted on the Swansea method. The average per-centage of the ore produced from the different mines is as follows:—Alten, 5·5 per cent.; Quænangen, 7·34; Roraas, 3·06; Sælbo, 4·05; Meraker, 4·05; Tranfield, Ytteroen, 14·4. Sixty workmen during the same period were employed on the different lodes of chromate of iron: 510 tons of this were obtained at the cost of 5,977 dollars. The establishment for the manufactory of chromate of potash had reduced  $458\frac{1}{2}$  tons of chromate of iron, and had used in its reduction 12,428 barrels of coals = 1,380 tons; 163,076 lbs. Russian; 93,257 lbs. Norwegian; and 921 lbs. American potash. The total expenditure of the manufactory was 35,494 dollars 110 skillings; while the produce was 308,890 lbs. chromate of potash, valued at 41,000 dollars—making a profit on the year of 5,505 dollars. The total production of the whole of the district was valued at 252,250 dollars. In the same year, setts (*muthings*) were taken for 15 copper-mines, 4 chrome, and 1 lead. But few of the copper-mines were paying any dividends, the generality merely supporting themselves. With the exception of the works at Omdal, in Tellemarken, and Søtersdal, near Christiansand, which are now abandoned, all the copper-mines of Norway lay in the northern district, so that we have here the total production of copper as well as that of chromate of iron.



## MINING IN GERMANY.

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FROM remote periods the Germans have been celebrated for their skill in mining and metallurgical arts, and the mining schools of Saxony had attained great celebrity previous to the discovery of many of the metals in England. In fact our first copper-miners were Germans, the names of Cornelius Devoz and Daniel Houghsetter being found among the first patentees of the "Mineral and Battery Works" and the "Mines Royal Company," both of which companies are now incorporated under the latter designation. From the construction of the country, absence of a sufficiency of fuel, and various causes, mining operations are conducted on a different system to that pursued in the United Kingdom. The principal mining countries are Hanover and Saxony; the constitution of the mining code is nearly similar in both countries, nor do the processes vary in a great degree. As these, however, are comparatively unknown in England, a brief sketch of the establishments at Hartz, in Hanover, and Freyberg, in Saxony, may not be uninteresting to our readers.

Under the name of the Hartz is comprehended all that natural mountainous district from the centre of which rises the Brocken, and which group contains a variety of rich metallic deposits, which have been worked for ages, and still continue to be the objects of successful explorations. The principal mines are those of iron, silver, lead, copper, and manganese, gold being occasionally found. This range of primitive and transition rocks rises from the centre of the vast secondary plain, bounded on the south by the primitive formations of Saxony, on the east by those of transition which extend to Dillenburg, and on the north by the vast slopes composed of the alluvium of the Baltic and the Atlantic. Its greatest length is fourteen and a half leagues, and its breadth from Wernigerode to Illfeld is six leagues.

The Hartz terminates with the commencement of the secondary plains, having on the north the villages of Goslar, Ocker, Neustadt, Isedburg, Blankenburg, &c., and on the south Stolberg, Ellrich, and Osterode.

The mountains forming this group are not celebrated for their height, the Brocken being the most elevated (three thousand five hundred feet), known as the site of the exploits of the imaginary Faust, and justly celebrated for the magnificent and extensive view enjoyed from its summit, extending on the north beyond the Elbe. Nothing can be more characteristic and melancholy than the aspect of these dreary plains, which occupy



the middle elevation of this range; they are singularly contrasted with its beautiful and picturesque valleys.

That upon which Clausthal and Zellerfeld are built may be taken as an example; it is covered with a meagre swarth, scarce sufficing the few cows that supply these places with milk; for the other provisions of life, the inhabitants are forced to have recourse to the lower and more prolific surrounding country. The earth beneath appears to have grown rich at the expense of its surface; the Creator, banishing all other sources of happiness and wealth, has apparently placed everything in subordination to the mines, as if they alone were sufficient for the wants of man. The aspect of the country is sterile; the potato appears to be the only vegetable which this ungrateful country fosters. The clouds, which, hurried on by the winds, are here constantly passing, render these places disagreeable and unwholesome. The sun scarcely ever appears through the dense mist that lowers over and about Clausthal. The temperature is that of the lower countries during the winter.

The curious who visit the Hartz generally ascend the Brocken\* to enjoy the beauties of the setting and rising sun. The mountain, as well as the inn, which is constructed on the peak, appertains to the Count of Wernigerode, to whom a list of the names, professions, &c. of those who may have passed the night there is daily sent, bearing such remarks, complaints, &c., as those who attach their names to it may deem proper to make, being similar to the skyds-book used in the Scandinavian peninsula. A view from the summit of this mountain is as essential to the geologist as it is gratifying to the lover of nature, inasmuch as this is the only point from which a correct idea of the disposition of this interesting group can be attained. The Hanoverian Hartz is divided into sixteen mining arrondissements or districts (*Bergweihzuge*); six of these are in active operation. A number of the villages are distinguished by the enjoyments of certain privileges, and are termed mine cities (*Bergstadt*); they generally owe their origin to the exploration of a vein. Thus the mines near Clausthal and Zellerfeld were opened in the year 1600, and the above places were then founded. The veins at Andreasberg were discovered in 1520, and the cities founded the following year. They are the following:—Clausthal, Zellerfeld, Wilderman, Grund, Sausenthal, Andreasberg, and Altenau.

The mines and works are under the direction of a council, which holds its meetings at Clausthal, where there is a school of mines possessing an extensive mineralogical cabinet, and a remarkably fine collection of models of the different machines used in the working of mines. Those minerals found in the

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\* The scene of *Faust* and *Der Freischutz*.

mines, and possessing a certain intrinsic value, are sent to the school, where they are taxed and exhibited for sale.

The administration of the mines is worthy of the highest praise; the different situations are accorded only to those persons who have proved their capability, by long and particular practice, seconded by theoretical information respecting their occupation. Each individual has his immediate calling, and gives himself entirely to the acquisition of that knowledge which his department demands. Thus, there are especial engineers for the iron-works, for those of lead, for the machines, &c. Honesty and civility characterize those employed, and there is scarcely a workman, who, if questioned concerning anything that regards his duty, will not answer with promptitude, attention, and precision.

Considering the natural situation of this district, a temperate climate could not be expected; it is cold and wet during the winter, the thermometer frequently descends to  $32^{\circ}$ , and never rises above  $30^{\circ}$  during the summer. Thus the inhabitants, with little interruption, keep a fire in their respective apartments during the whole year. The mines, then, are the only primitive sources of industry in the Hartz, and there is not an individual who is not dependent more or less upon them. Thus a state of society is presented differing in this respect from that of any other part of the world. The forests are subservient to the wants of the mines, or to subsequent operations; and the administration, being a distinct one, consults the wants of these establishments before granting to individuals the use of combustibles.

The silver-mines are generally found in the western part of the range, supplying the works that are constructed in the immediate vicinity for the treatment of the ore. The principal are those existing near Goslar, Clausthal, Lankersthal, and Andreasberg. The most remarkable is the vein which extends from Wildermen to Clausthal, traversing the city of Zellerfeld, a distance of about three miles. This vein, as are the others, is divided into a certain number of parts, termed concessions, by planes dissecting the vein perpendicularly. These concessions are let out, and generally wrought by companies. Each mine has thus a distinct administration, all operations being practised within certain limits subordinate to the decrees of the general council of mines, which hold their sittings at Clausthal, general utility being their primary consideration. The shafts Caroline Doreathea, Du Wilhelm, and Rozenlof are sunk upon the above remarkable vein. The ores from the environs of Clausthal contain from one to four ounces of silver per quintal. The objects of the different explorations at Andreasberg differ entirely from those already mentioned, in the nature of their ores, in the richness of those that are similar, and in the manner in which they

are found. There exists as great a difference between the ores found at Andreasberg and those of Clausthal as there is between the physical geography of the country around these respective places. The veins are numerous, and are not celebrated so much for their length as for their extreme richness. They vary in breadth from fifteen to twenty-three inches, differing in this respect from those at Clausthal. It appears that the ores increase in richness in proportion as they descend. A remarkable instance of this fact exists in the celebrated mine of Sampson, which is incomparably the deepest shaft in the Hartz; the lowest gallery being fifty-five feet below the surface of the Baltic, and 333 lachlers (about 2,229 feet) below the surface of the earth. The descent into these mines is practised altogether by means of ladders, one-half the main shaft being separated into distances of about twenty-five feet by means of platforms, thus rendering the fatigue more supportable, and the descent less dangerous. The vein upon which the Sampson is constructed is limited on the N.W. by the vein termed Neufang, limiting in its turn the vein Greade-Gotles on the S.W. A remarkable fact observed here is, that the richness of the vein is not increased at the point of junction of two veins; on the contrary, the crossing vein always becomes barren beyond the joining point. After the two mines already mentioned, the most celebrated are those of Andreasberg, Claufrederick, &c., having a mean direction from N.W. to S.E., occasionally crossing each other at different and appreciable angles.

The Ramelsberg is an elevation of about 1,230 feet above the plain upon which Goslar is situated. This mountain, which bears the same name as the mine, forms a part of and limits the argillaceous slate on this side of the range, passing often into grauwacke. This rock has a mean inclination of near forty-six degrees, like that of the metallic deposit, which has been successfully wrought since the year 968. The cropping out of this immense bed is seen about half-way up the mountain, where it has but little capacity; but it increases as it descends, having a thickness at the bottom of upwards of 180 feet. Near the centre the dépôt is separated, and forms two beds; the inferior has the least capacity, and is nearly exhausted. The greatest capacity of this deposit exists at the point of separation. The mass is abruptly terminated with an inclined plane, forming an angle of forty-five degrees with an horizontal line drawn from the direction of the base. Disseminated masses of the gauque become frequent; and, what is remarkable, the richness of the ore diminishes as these masses of rock become more abundant; all these appearances coinciding to announce the approaching dissolution of a source of wealth, on which the inhabitants depend for their existence; notwithstanding, an immense portion of ore still exists awaiting extraction.



On account of the nature of the ore, which is compact and excessively hard, the system of extraction here employed differs from that practised in any other part of the Hartz, and perhaps in the world. To give an idea of the obstacles with which the miners employed at the Ramelsberg have to contend, we give the following extract of a process-verbal, drawn up in 1808, to prove the impossibility of applying the ordinary mode of extraction (by means of powder). "The ore, on which this assay was commenced, was compact, very hard, and chiefly composed of iron and copper pyrites. A workman was employed eighty-eight hours in boring a hole four inches deep; during this time 201 boring-augurs were rehardened, and twenty-six were remounted with steel, and 126 were entirely destroyed. The method of working actually employed is by fire, which has a powerful disaggregating action upon the ore. The heat is applied by means of a pile of fir-wood, built up from the floor to the ceiling of the gallery; this wood is of easy ignition, and, like all other resinous wood, produces a great deal of flame; some time after the fire is put to the pile, a continual cracking is heard, produced by the disaggregation and falling of the detached ore. Without doubt this separation is due chiefly to the expansive force of those matters capable of taking a gaseous form, as arsenic, sulphur, water, &c. After the temperature has sufficiently fallen, the workmen arrive and separate a great deal of ore attached, but not detached by the fire, notwithstanding the great action of heat. The use of powder cannot be thus entirely replaced, for there is a certain part of the gallery, the inferior angle, upon which the flame has little or no action, and the employment of powder is of absolute necessity, which enormously increases the expenses of extraction. All expenses paid for the extraction of forty tons of ore, by the method of blasting, cost from thirty-eight to forty Prussian dollars, and the same quantity, by means of fire, twelve dollars and a half. The Prussian dollar is equal to 3s. 4d. sterling. Thus, if by any means the combustibles in the Hartz should be destroyed or become scarce, as not to permit of being thus employed, either some other mode of extraction sufficiently economical should be substituted, or the ruinous necessity of abandoning the Ramelsberg will be a necessary consequence. The quantity of ore extracted per week is about forty tons."

Freyberg, in Saxony, is one of the most celebrated mining towns in Germany. The practical branches of mining, the customs, manners, and even the legislation of the mines, are transmitted from father to son, in such a manner as to give to the profession a durable stability, which has continued from remote periods until the present day. The possession and the right of exploring the mines were formerly absolutely vested in the Crown; at a later period, the same rules were adopted with



regard to the smelting-works; afterwards the mines were allowed to be worked by private individuals, although their administration was subjected to the Government control, which remains in force until the present day. The consequence of this legislation has had this good effect—that the mines have been preserved from rapacious and unfair explorations; many of them being of great antiquity, would have been long since exhausted and abandoned, if the proprietors had worked them solely with a view to present profit, instead of considering their ultimate development and durable existence. The disadvantages, however, are daily felt, not only in the number of officers employed to enforce these regulations, but likewise in the multiplicity of ordinances and laws which have been promulgated at different epochs. For a number of years, the legislative body of Saxony have intended to ameliorate and reform those laws, but as yet have arrived at no practical result or definite determination, which has tended to keep the mining interest in a visible state of depression. Although the exploration of the mines is carried out according to the most practical and scientific methods, a due regard being paid to economy, the system, with its vexatious interference and regard to forms and trivialities, has many and great evils. Decisions which are determined in other countries by a body of directors are made in Saxony by a variety of councils, which are the Ministry of the Finance Department, the Ober-Berg-amt, the Superior College, the Council of the Smelting-Works, the College of Mines, who are again assisted by a corresponding number of officers, whose duty it is specially to direct and watch the manipulative departments in the mines and smelting-works. Among the officers are men possessing great abilities, who have studied the theory of mining and smelting in the celebrated academy of Freyberg, and have undergone a practical education in the works. It is scarcely necessary to mention the names of Werner, Charpentier, Von Herder, Plattner, Weisbach, Reich, and Breithaupt, who were all students at this academy. There are about 126 mines in the vicinity of the city. The veins traverse gneiss rocks, and are generally of quartz, calcareous fluor spar, and sulphate of barytes; the metallic ores are argentiferous sulphuret of lead, red silver ore, argentiferous grey copper ore, zinc, and some other ores of copper and lead, with a small quantity of nickel and cobalt. The Himmelfürst is situated about two miles south-east of Freyberg. The elevation of the surface above the level of the sea is 1,346 feet; to the bottom of the mine about 300 feet. There are five veins in this mine; the principal vein (*teichflache*) is from 1 ft. 6 in. to 3 ft. in width; the others are from 6 to 12 in. wide. The direction of this vein is nearly north and south, and its underlay is west about 3 ft. per fathom. The ores consist of sulphuret of lead, native silver, sulphuret of silver, and red

silver; their produce is from 6 to 7 oz. per quintal of 100 lbs., equal to  $3\frac{3}{4}$  or  $4\frac{1}{2}$  parts in 1,000 parts of ore, or from  $\frac{3}{8}$  to  $\frac{1}{2}$  per cent. The vein-stone is quartz and pearl spar, and the ores are accompanied by blende, spathose iron, and arsenical pyrites. About 700 miners are employed, of whom 600 work underground. In some of the mines there are above 100 veins; nearly every mine has its own administration; in general they are divided into 128 shares (*kuße*), which belong to private adventurers. The levels in all the mines are constructed and kept in repair and order by the Government; the expense, to which each mine is bound to contribute, is levied from a rate, fixed according to the quantity of silver contained in the ores raised. This varies from  $\frac{1}{4}$  oz. in the quintal to 60 per cent. or more of silver; the average in general is from 1 to 3 oz. in the quintal. The ores are delivered to the Government works, where they are partly smelted and partly amalgamated. The smelting-works purchase them according to the contents, which are fixed by assay with the blow-pipe, founded on a system which has been proved to be invariably correct, and conducted with a mathematical exactitude. This improvement has principally been owing to M. Plattner, who has practically brought into use the importance of the blow-pipe, not merely as an instrument of chemical recreation, but a correct standard of assay. The blow-pipe, with its apparatus, forms a complete portable laboratory, and is a useful guide to both the smelter and miner. The different processes are the raw fusion (*fondre cru*), the fusion of the lead, the cupellation, the refining of the silver, and the reduction of the litharge. Not only in Freyberg, but in all the smelting-works of Germany, the preference is given to smelting lead and argentiferous ores in high furnaces; those at Freyberg are from 13 to 14 ft. high.

The raw fusion (*fondre cru*) is performed with a double purpose—first to concentrate the small quantity of silver disseminated in the mineral, which without this process would be useless, and to receive a substance of precipitation for the manipulation of the fusion of the lead. The minerals which are fused contain a quantity of different earthy matters, and the metallic ores are principally pyrites of iron, with  $\frac{1}{4}$  to  $1\frac{1}{2}$  oz. of silver to the quintal, 2 to 4 per cent. of lead, and  $\frac{1}{8}$  per cent. of copper. It is necessary to pay particular attention, that, in smelting the slag, there are more single silicates, until the formation of the bisilicates. The matte contains principally sulphureous iron, with about 3 oz. of silver to the quintal, 4 to 10 per cent. of lead, and  $1\frac{1}{2}$  per cent. of copper. Afterwards this matte is roasted in the open air, laid on a bed of wood. This burns with great facility, as it contains nothing but sulphureous metals. A roaster generally contains from 300 to 400 quintals of matte, and burns from four to eight weeks, until it goes out. About a

third part is roasted, which lies at the bottom ; that on the top is placed in another roaster, to undergo the same process. By this roasting a great quantity of the sulphur is volatilized, and some of the oxides are freed from the metal.

Recently the mines have produced such quantities of these ores, that another method has been hit upon to reduce the silver. For this purpose they have commenced smelting in reverberatory furnaces, as used in England for smelting copper ores. The matte is roasted and smelted a second time to concentrate the silver. It is expected that this method will produce favourable results ; and it is intended to be adopted for the future in heating these ores.

*The Fusion of the Lead.*—For this it is necessary—first, to submit the ores containing lead and silver to a roasting in the reverberatory furnace to volatilize the sulphur ; when about to be smelted, a third part of the mineral, a third part of the roasted matte, and a third of the scoria, is taken ; from this slags, which are nearly single silicates, should be obtained ; a portion of the oxidulated iron which is in the matte combines with the earthy minerals to form a siliceous slag ; another part of the oxidulated iron is reduced by the process of smelting, and combines with the sulphur contained in the mineral and the matte, and forms sulphureous iron (*schwefeleisen*), so that another matte is obtained, consisting of sulphureous lead (*schwefelblei*), sulphureous copper (*schwefelkupfer*), and sulphureous silver (*schwefelsilber*), &c. At the bottom of the melted mass is the metallic lead with the metallic silver ; on this is the matte recently formed, and above all the scoria ; sometimes, but this depends on the quantity of the ores, a second matte is smelted, containing arsenical nickel, which has a different specific gravity to the ordinary matte, so that the separation of the mattes is not difficult. In the smelting in general, some products of the lead obtained from cupellation are added.

By this process, two valuable products are obtained—lead in combination with silver, and the matte. This latter is treated several times, until these metals are extracted, and nothing remains but sulphur, iron, and copper. From this, by degrees, a matte of copper is formed, from which the pure copper is extracted. The separation of the silver from the lead is made by cupellation. The cupellation furnace has a fixed foundation, with a moveable cap, or elbow, of iron. The smelting-bed is made every time by powdered clay and lime. At the side of this furnace is the fire-furnace ; the blast, which is propelled by two pair of bellows during the cupellation, should be placed in a rectangular direction towards the flame. Firstly, the impurities contained in the lead separate, and are evaporated by a chimney from the furnace. The blast gives its oxygen to the liquid lead, to form litharge (oxide of lead), and this process is



continued until the silver appears; the fire is then extinguished; water is poured in the furnace to prevent the silver volatilizing. As it is impossible, in a furnace of these dimensions, to obtain the silver entirely pure, it is necessary to refine it; for this purpose they use small plates, in which a bed of the same formation is made, as in the operation described above. By means of the blast, charcoal, and a mantle of iron which surrounds the whole, the silver is made fluid; the mantle and the charcoal are then removed; wood is put in front of the blast to cause a direct flame. From time to time, an assay is taken with an iron bar, and the silver is pure, if the little assay, in cooling on the bar of iron, throws out different prismatic colours, which appear to resemble the refraction of the rays of light. In one of these plates about 25 lbs. of silver are refined. The production of this smelting, and that of the amalgamation-works, is annually about 70,000 to 80,000 marks of silver, of the value of about 140,000*l.* sterling. The production of lead is about 30,000 quintals, of the value of about 20,000*l.* sterling.

The reduction of the litharge is performed in one of the high furnaces, but not with coke, which is generally used: charcoal is the fuel employed, as the cokes are not sufficiently good and pure. This process is very simple, as it is only to burn the oxygen of the litharge with vivid charcoal until nothing but the metallic lead remains. The other system of extraction is conducted with mercury, in the amalgamation-works. The metals freed from lead are submitted to this process. They are mixed with chloride of natron (*chlornatrium*). Afterwards they are calcined. It is necessary to pay particular attention to this, in order to volatilize as much as possible the foreign substances, such as sulphur, zinc, arsenic, &c.: a combination of silver is formed with the chloride. The natron combines with the sulphur, and forms a sulphureous natron. The amalgamation is so conducted that the balls which are formed in the heat can be prepared, if necessary, for another calcination. The powder itself is ground in mills, and put in barrels; water, metallic iron, and mercury, are added; these barrels are turned or rolled for about twelve hours; a current of galvanism is excited by this movement, which causes the chloride to leave the silver, which enters into combination with the mercury, while the chloride unites with the iron and forms chloride of iron. At the bottom of the barrels, the amalgamation, or combination, of silver and mercury is found. A portion of the mercury, which is not chemically combined with the silver, and which forms with the mercury a crystallization, with the crystals of the silver, is placed in an iron retort, well closed, having only one aperture, with a *tuyère*, which is conducted into a receptacle of cold water; the fire is made round the retort, so that the amalgamation becomes red hot; the mercury being easily volatilized,



escapes by the *tuyère* into the water, there it forms vapours, which are condensed to metal. The residue in the retort is the refined silver; the silver obtained by the process of amalgamation always contains copper; it is impossible to avoid this. This is not of much importance, as, in all the silver which is coined, it is necessary to add an alloy of copper to the pure metal.

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## THE TIN TRADE.

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THE production of tin in the county of Cornwall is well known to be of the greatest antiquity, it being mentioned by Herodotus, who lived 450 years A.C. Diodorus Siculus, who flourished a short period after, supposes the Scilly Islands to be the Cassiterides. It has not, however, been authentically ascertained whether the Phœnicians and Grecians interested themselves in the management of the mines in Cornwall, or that they merely purchased and exported the tin after it was raised. The Saxons, who had no authority in Cornwall until after it was entirely conquered by Athelstan, neglected the tin-mines; and it was not until after the Norman conquest that they were prosecuted with any degree of vigour. In the reign of King John, their production was, however, so small, that the farms of Cornwall amounted to no more than 100 marks per annum; according to which valuation, the Bishop of Exeter received, in lieu of his tenth part, the sum of 6*l.* 13*s.* 4*d.*; while those in Devonshire amounted to 100*l.* yearly. At that period, our miners must have made some progress in their profession, as we find, shortly afterwards, according to Matthew Paris, that a Cornishman, who had fled to Germany on account of a murder, first discovered tin there in the year 1241, from which period the mines of Schonfeld date their origin. About this period, the mines were worked in Galicia and Portugal; but, on the expulsion of the Moors from those countries, this, as well as every other branch of industry, languished, and was ultimately totally abandoned. About the commencement of the sixteenth century, mention is first made of Malacca tin; but it was not imported into Europe before the middle of the seventeenth century.

In the year 1693, in consequence of a fall in the price of tin, the tinnerns of the counties of Cornwall and Devon published a proposal for the redress of their grievances, and the raising of

the price of their tin. It states that, "in the year 1692, according to the coinage-books, only 11,174 pieces were coined; the duty, being then 4s. per cwt., amounted that year to 5,449*l.* 17s., making only 27,249 cwts. raised; that quantity, sold at 50s. per cwt., would realize 69,222*l.* 10s.; out of this was to be paid to bounder and lord of the soil about one-fifth, which would amount to 13,844*l.* 8s.; the charges of smith's work, timber, ropes, and candles, were computed to each man, in a year, about 20s., which, for 8,000 men, would be 8,000*l.*; and, supposing the dressing and stamping to make every cwt. of tin come to 2s. 6d., it amounts to 3,406*l.* 2s. 6d.; the charges of refining that year's tin, at 30s. the tide, computing 1,000 of tin to be refined in each tide, come to 2,725*l.* 7s. The charges of carrying and the expenses at the refining or blowing-house, at 10s. the tide, the whole sum to be deducted comes to 28,884*l.* 9s. 10d., which deducted, there remains to be divided among 8,000 tanners but 40,338*l.* 0s. 2d., which comes to 5*l.* 0s. 10d. and about half a farthing to each tinner, and this is all each tinner hath to maintain himself and family, and for his whole year's hard labour, not only under ground, but under God knows how many grievances.

"The Cornish factors and others are not the only causes of the poor tanners' misery—the Cornish *lawyers* must come in for a share too; for as the factors grind the poor tanners, to gratify the principal traders, and thereby increase their commissions, so the lawyers (upon the discovery of a rich mine), taking the advantage of the tanners' ignorance in the Stannary laws, they being not set forth, and published in print, do use all means (by way of pretended justice) to right those clients against the bounder, the landlord, or the fellow-adventurers, when, in truth, it is in the main a contrivance to make themselves masters of those mines, and the profits thereof, and the tanners the slaves, only to dig the ore for them; and this they sooner do, because the fees are so great, and the lawsuits which they create so dilatory, that in proportion they exceed all other grievances; whereas the tanners' privilege, as I am informed, is to have their proceedings at law altogether in English, and, upon payment of one penny only, they are at liberty to appear in person, and to speak and act for themselves, that their causes may be the sooner ended. The quantity of unwrought tin transported from London, in the year 1692, amounted in the whole to 61,413 cwts., besides the unwrought tin transported from other places.

"The reasons for raising the price are because the public use of silver plate is so much abated in the nation—because tin improved by art is next in nature to gold and silver; and it is the honour and interest of the nation to refine tin—it being our own commodity. The higher the price of tin, the more

it will be in fashion; the more it is in fashion, it will be refined; the more it is refined, the more fitter it will be for plate; the more tin there is in plate, the more silver we shall have in money—the more money we shall have to lay out in the most refined and fashionable pewter. The finer the pewter is in quality and fashion, the higher will be the price of tin. The higher the price and quality of tin, the greater quantity will be consumed; the greater the consumption is, the better it will be both for the rich and poor. The poor will get more wages, and the rich more wealth; *for all markets are governed by the first market price*; and as the quantity, quality, and price of tin shall rise, the more it will be for the honour and interest of the nation in general; and the counties of Cornwall and Devon, in particular, will be the better enabled thereby to serve their country, in mind, body, and estate. The better, therefore, to prevent the Cornish factors underbuying one another, and bringing down the price of tin, to the prejudice of the public, that a law may be made here, that no one shall buy or sell tin under 3*l.*, 3*l.* 10*s.*, or 4*l.* per cwt.; for the higher the price has been, the better the commodity goes off. The Dutch do not import so much tin from the East Indies in twenty years as the county of Cornwall in one. The tin brought by them is from the kingdom of Siam; the principal places whereof are Jahore, Perah, and Quedah; and, where it is sold by weight, called a bahar, which is equal to about 390 lbs. avoirdupoise. In Siam it fetches about 12*l.* sterling per bahar.

“The Dutch have made some attempts to engross this commodity, and did contract with the King of Siam for the whole quantity, at the rate of 9*l.* per bahar; and they obliged the King of Perah, by force, to sell all he has to them; and they used formerly to block up the port of Quedah, to prevent its sale there to any but themselves. Germany, by its nature and situation, cannot afford so good tin as England, nor so cheap, by as much as 3*l.* per cwt., and when tin was above that price, we have supplied that country as well as Holland. The miners’ wages being fallen from 30*s.* to 15*s.* a month, great distress has been the consequence; the only way in which to remedy it, is to make a law to prevent the price of tin falling at least under 3*l.* per cwt.; and though it is the interest of the factors, the pewterers, and merchants to buy cheap and sell dear, yet where the private gain doth not occupy the public good, there will be little commonwealth to carry on a vigorous war; and as Britain hath its name from the tin which was first found in the county of Cornwall, we cannot begin to regulate trade, and to raise the nation, better than by trying all experiments upon that useful commodity, whereby we may raise the kingdom to a pitch of honour and empire, which Old England (in all its



glory) was never able of acquiring." The proposal concludes with this appeal to the king and kingdom.

" Henry the Eighth, of this great nation,  
Began the famous Reformation,  
His daughter, Queen Elizabeth,  
Finisht the second ere her death;  
And now the king is almost rife,  
To cut the third out to the life,  
And raise this nation to that stature,  
For which it was cut out by Nature,  
And 'twas the nature of our white tin,  
From whence it hath the name of Britain."

Though it was impossible for the legislature to regulate the price, they wisely opposed the king, who wished to please his Dutch subjects; and protection was prudently retained. Under this system, the Cornish mines progressively increased; and, previous to the discovery of the copper-mines, were considered the most important branch of industry in the county.

The tin-mines of Banca are said to have been discovered in the year 1710-11. These are in general worked by Chinese. In the year 1776 the metal was raised at the rate of five rix-dollars the 125 lbs. In the year 1778, the Dutch East-India Company brought into Europe 700,000 lbs., of which 100,000 lbs. were sold in Amsterdam for home consumption. The tin sold in Amsterdam between the years 1775 and 1779, amounted, in the whole, to 2,421,597 lbs. The mines of Banca produce now about 3,000 tons yearly, although at some periods, when the demand has been great, the production has increased to 3,500. The cost of mining and smelting is supposed to be about 40% per ton: 890 tons of tin are annually produced in the island of Ceylon, the cost of which averages, free on board, 48% per ton. The cost of smelting a ton of tin in England has been calculated to be 78*l.* 17*s.* 6*d.*—viz. 1½ ton of ore (say), 75*l.*; 1¾ ton of coals, 10*s.* per ton, 17*s.* 6*d.*; labour, wear and tear of furnaces, &c., 3*l.* A loss of 5 per cent. of the metal is said to occur in the reverberatory process—that in the blowing-houses is said to be 15. These last are principally used for producing grain-tin, or, as it is called by the French, *étain en larmes*, which is produced from stream-tin, that from the tinstone forming block tin. The reverberatory furnaces are about 6 ft. by 12 ft.; about 600 cwts. of average ore will produce 350 of tin. Culm is used as a flux; wood was formerly the only fuel; in the year 1680 coal was first used. From the absence of any authentic records, it is impossible to say what the exact production of the Cornish tin-mines may be. In the year 1817, 4,120 tons were coined; in 1820, 2,773½; in 1827, 5,316; in 1829, 4,396; in 1834, 4,130; in 1835, 3,899. At the present period, it may be calculated that from 6,500 to 7,000 tons are annually raised; at the com-



mencement of the last century from 1,300 to 1,500 tons were the average yearly returns. In the year 1750 the returns were about 2,800 tons, and the next fifty years the produce varied from 2,000 to 3,000 tons. The price, since the commencement of the present century, has varied considerably. In the year 1800, it was 5*l.* 1*s.* per cwt., and steadily increased until the year 1806, when it realized 6*l.* 6*s.* In the two subsequent years it had a tendency to decline; but in the year 1809 the price was 6*l.* 2*s.*

Owing to the war and the blockade of the continent, from this year it further increased. In 1810 it fetched 7*l.* 17*s.* 6*d.*, the highest amount it ever yet attained; 1811, 7*l.* 11*s.* 6*d.*; 1812, 6*l.* 8*s.*; 1813, 6*l.* 14*s.*; 1814, 7*l.* 16*s.* 6*d.*; 1815, 7*l.* 6*s.* On the termination of hostilities, it fell, in the succeeding year, 1816, to 5*l.* 14*s.* 6*d.*; in 1819 it was 3*l.* 16*s.* 6*d.*; in 1823 it had again risen to 5*l.* 5*s.*; in 1825 it had fallen to 4*l.* 9*s.* 6*d.*; and at the commencement of the year 1830 it was sold at the rate of 3*l.* 13*s.*; in 1832, 3*l.* 12*s.* 9*d.*; in 1835, 4*l.* 11*s.* 6*d.*; in 1836, 5*l.* 9*s.* 6*d.*; in 1839, 4*l.* 8*s.* 6*d.*; in 1840, 4*l.* 2*s.*; in 1844, 3*l.* 13*s.*; in 1847, 3*l.* 13*s.*; in 1848, 3*l.* 19*s.*; in 1849, 4*l.*; while its present price, according to the last quotation, is 4*l.* 5*s.* In 1790, the quantity of British tin exported was 2,910 tons; in 1800, 1,782 tons; during the war the average exported was about 1,000 or 1,200 tons annually; in 1825, 1,712 tons were exported; in 1836, only 558. The quantities of foreign tin imported were—in 1815, 325 tons,—of this 198 were exported; in 1824, 319 imported, 235 exported; in 1825, 211 imported, 235 exported; in 1832, 1,460 imported, 1,086 exported; in 1838, 1,536 imported, 1,451 exported. In the year 1846, 20,306 cwts. imported, 21,038 exported; in 1847, 23,307 imported, 11,471 exported; in 1848, 5,975 imported, 834 exported; in 1849, 35,545 imported, 8,940 exported. The exports of tin, the produce of Great Britain, were—in 1848, tin unwrought, 35,946 cwts.; in 1849, 35,267. The declared value for the last four years, of unwrought tin exported has been, in 1846, 107,456*l.*; in 1847, 159,466*l.*; in 1848, 143,085*l.*; in 1849, 141,577*l.*, making a total value of 555,584*l.* That declared on tin plates was—in 1846, 639,223*l.*; in 1847, 462,889*l.*; in 1848, 532,142*l.*; in 1849, 711,649*l.*, making a total value of 2,345,903*l.* Owing to the prohibitive duties in France and Belgium on tin plates, our manufacturers do not export so largely to those countries as they would under a system less restrictive; a great quantity of the Banca tin is used in the United States.

The countries which imported tin to England last year, were—Singapore, 136 tons; Holland, 74; Belgium, 27; Spain, 21; Peru, 18; China, 15; British India, 7; Cape of Good Hope, 1—making a total of 299 tons. The three countries to which we export the greatest quantity are Russia, France, and Turkey.

Of foreign tin, 4,698 cwts. were entered for home consumption in 1848, and 16,715 cwts. for the same purpose in 1849. There can be no doubt that, were the duty on foreign tin repealed, our tin-plate manufacturers would be able to enlarge their already enormous trade, as the quantity of unwrought metal now taken by the French and Russians is used for their own manufactures. In spite of the fiscal regulations imposed in those countries, our manufacturers are enabled to compete with them ; and were those governments to release their duties, would, in a short period, by their superiority of workmanship, undersell them in their own markets. The repeal of the duty here, while it caused the ruin of our home mines, would be only of benefit to the clique of manufacturers. The gross amount of duty received in the year 1848 was 1,438*l.* ; in 1849, 1,622*l.* ; being so inconsiderable, that as an article of revenue it cannot be taken into calculation. It is so far important, that so long as this is retained, it precludes the Dutch and others from importing the metal, to the detriment of our native industry. In 1838, the government, by abolishing the coinage-duty, freed the mines from a grievous impost, and it is to be hoped that they will pause before they take from them that protection which is vitally necessary to their well-being and positive existence.

The smelting trade is confined to a few houses, who generally are interested in the mines. The following are the names of the works and their several proprietors :—Calenick, Messrs. Michell and Co. ; Carordras and Treloweth, both belonging to Messrs. Daubuz ; Charlestown House, Messrs. H. I. Enthoven and Sons ; Angarrach and Chyandour, Messrs. Bolithos ; Trethellan and Millineur, Messrs. Williams, Harvey, and Co. ; Taniar Union Company, Bissoe, Messrs. Tregoning and Co.

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## THE QUICKSILVER MINES OF ALMADEN.

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THESE mines belong to the Spanish crown, and are situated in the province of La Mancha, near the confines of Estremadura and Cordova. The town, called Sisapona Cetobrix by the Romans, and Almaden by the Arabs, is built on a hill rising gently between two mountain ridges, evidently ramifications of the Sierra Morena, which commences near the eastern confines of La Mancha. The town contains a population of over 7,000 souls, including the garrison and six adjoining villages, and is administered under a military *régime*. There is also a director of the mines, presiding over a separate department. The only

remarkable edifices in the place are the hospital and a prison for convicts.

So early were these mines known to the ancients, that Theophrastus, who lived 288 years before Christ, speaks of their produce, as also does Vitruvius, a contemporary of Augustus. Pliny says that they are situated in Bætica, which is substantially correct, Almaden being the last town in La Mancha, and separated from Cordova only by a rivulet. The same historian further remarks, that these mines were kept constantly closed, and only opened by special license from the emperor, adding, that as soon as the supplies required for the consumption of Rome had been obtained, the approaches were carefully shut. These minute particulars warrant the inference that the Romans established works there; but no vestiges now remain, so great is the change which the ground has since undergone. The Romans entertained the idea that mercury was dangerous, owing to its poisonous qualities, and yet their matrons used it to beautify the skin. Their painters also mixed it in their colours; but the apprehension of an improper use being made of it may have given rise to precautions in order to prevent its general circulation.

During the dominion of the Arabs in Spain, these mines lay neglected. There is indeed reason to believe that they entertained the same prejudices regarding mercury as the Romans, and, consequently, seldom used it. To them, agricultural pursuits were more congenial than mining, and in those days, moreover, quicksilver was not a marketable commodity in the commerce of Europe. So little aware were the Spaniards themselves of the valuable resource which they possessed in this article at home, that South America had been discovered nearly two centuries before Almaden supplied the fluid mineral used in the amalgamation of silver ore. At first the Mexican miners consumed quicksilver obtained from Peru, but the supply being found insufficient, recourse was had to Austria. The quicksilver mines of Idria were not discovered till the year 1497, and then by accident. A cooper happened overnight to place a new tub under a dripping spring near his workshop, for the purpose of tightening the joints, and next morning was surprised on seeing at the bottom a shining fluid, with the nature of which he was wholly unacquainted. Struck with the phenomenon, he repeated the experiment till he had collected a sample in a phial, with which, full of hope, he trudged off to the nearest town, and submitted it to the inspection of a chemist. It proved to be quicksilver, when the Crown claimed the mine from which it issued, and for several years afterwards, in Europe at least, monopolized the supply.

The Spanish miners in Peru first used quicksilver in the separation of the precious metals—a discovery which is said to



have taken place about the year 1571, and is generally attributed to Pedro Fernandez Velasco, at the time governor of Huanca-velica. At this place a quicksilver mine had been discovered in 1566, in consequence of a vermilion stone being found on the person of an Indian, with which he and his tribe painted their faces, and it was from this mine that the South Americans obtained their first supplies. When no more quicksilver could be procured from Peru, the Mexicans became, in some measure, dependent on Europe for an article essential in the preparation of their ores—a state of things which the Madrid cabinet gladly encouraged.

The demand increasing, and the outlay of money annually paid to Austria being found extremely onerous, the Spaniards at length turned their attention to the forsaken mines of Almaden. Labourers were set to work, and for several years these mines, together with the silver one of Guadalcanal, situated in Estremadura, near the Sierra Morena, twenty-three leagues from Madrid, and fifteen from Seville, were held under contract by the brothers Fuggers, Germans, and in Spain called Fucares, who, in these undertakings, gained a large fortune, which they realized and then returned to their own country, where they rose into notice. It is believed that the history of these enterprising merchants was not altogether unknown to the present mortgagees when they made their contract. During the administration of the Fuggers it was that the Spanish Government learned the value of the Almaden hill, and at the expiration of their lease the mines devolved to the crown. (Mark and Christopher Fuggers, natives of Augsburg, were in great favour with the Spanish monarchs of the Austrian dynasty, and from Philip II. obtained their first grants. Their descendants are now princes, the head of which is the Prince of Fugger Babenhausen, and possess large estates in Suabia. They are also allied to some of the first families in Germany. The fortune which they amassed in Spain gave rise to the proverbial expression, "*Ser rico como un Fucar*" (as rich as a Fugger), which occurs in "Don Quixote." In Madrid there is still a street bearing their name.) The galleries were repaired, and furnaces on a new principle introduced, the invention of which is attributed to D. Juan Alfonso de Bustamente. So valuable was this improvement considered, that, in 1719, M. Bernard Jussieu presented a memoir on the construction of the new or reverberatory furnace used at Almaden, to the Academy of Sciences at Paris, which led to their adoption in the Hungarian mines.

The mineral wealth of this interesting hill was not, however, scientifically explored till towards the middle of last century. In the year 1752, Mr. William Bowles, an Englishman, and a naturalist of some eminence, happened to be at Paris, where he became acquainted with D. Antonio Ulloa, one of the distin-



guished navigators who, in 1735, had been commissioned by the Spanish Government to make astronomical observations in South America, and who, jointly with his brother, had just completed the publication of a large edition of their well-known work of travels. Pleased with his society, and thinking that Bowles would be an acquisition in a country where public attention was directed to improvements in mineralogy, more particularly at a moment when the want of practical men was severely felt, Ulloa recommended our countryman to the Spanish ministry, by whom he was invited to Madrid and employed as a professor. Several pupils were placed under his care, many of whom distinguished themselves in various departments of science.

Among these were D. Jose Solano and D. Salvador de Medina. The first rose to the highest naval rank, and, it will be recollected, was murdered by the populace of Cadiz, where he held the appointment of governor at the time the French invaded Spain. The second died in California, where he had been sent to make astronomical observations, and especially to observe the passage of Venus by the sun's disc. D. Pedro Saura, a learned advocate, who died in Madrid, also studied natural history under our countryman. Wishing to turn his knowledge and experience to some account, Bowles was commissioned to make excursions into the interior, for the purpose of surveying the mines, and suggesting improvements in the method of working them. His first trip was to Almaden, accompanied by his pupils, where he executed his commission to the satisfaction of his employers, by recommending various improvements, both on the score of science and economy, which, under his superintendence, were carried into effect.

Of these, as well as of the locality, he gives some account in his "*Introducción á la Historia Natural y á la Geografía Física de España*," printed at Madrid in 1775, a work at the time held in such high estimation, that Dillon, who published his travels through Spain in 1780, adopted a large portion of it. In his preliminary discourse, Bowles avails himself of the opportunity to remark, that he was the first person who attempted to write a physical description of Spain; and it must be confessed that he endeavoured to render his labours useful by selecting practical subjects. Among these is a treatise on the management of Merino sheep, respecting which an interesting letter, the particulars of which were furnished by him, had previously appeared in the "*Annual Register*" for 1764, the first time the attention of the British public was called to this subject.

From the period of Bowles's visit, the works were conducted on a better principle; but, owing to original defects in the construction of the galleries, the mines, a few years afterwards, were inundated, which led to great difficulties and delays; in consequence of which, in 1784, the Spanish Government saw itself

obliged to enter into a contract with the Emperor of Germany for an annual supply of 6,000 quintals of quicksilver for Mexico, at the rate of 52 dollars per quintal, or 110 lbs. The article was shipped at Trieste, and conveyed to Cadiz, whence it was sent out to South America. The precarious nature of this supply, and the great sacrifice of capital, at length stimulated the exertions of the Spaniards, and, after an expensive and tedious process, rendered so by the defective nature of the machinery, the Almaden mines were drained. The works were then resumed, and placed under the direction of intelligent persons. So well, in fact, did the undertaking prosper, that in the course of a few years the importation of foreign quicksilver was dispensed with, and the Spaniards appeared on the list of exporters.

The hill on which the mines are situated is chiefly composed of sandstone, and on its summit rises a crest of naked rocks, streaked with cinnabar, indications which unquestionably led to the discovery of the mineral wealth concealed below. In other parts slate is seen, intersected with veins of iron, which on the surface follow the direction of the hill. The whole of the surrounding country abounds with ferruginous ore, and in the mines themselves portions of mineral are sometimes found, in which iron, quicksilver, and sulphur are blended together. The neighbouring elevations are composed of the same kinds of stone, present the same external appearances, and furnish the same plants.

The direction of the hill is from north-east to south-west, and its elevation about 125 feet. Two veins, from two to fourteen feet wide, and varying in richness, cross it in a vertical manner, which are called "La Mina del Pozo" and "La Mina del Castillo;" and miners have remarked, that the finer the sandstone, which serves as a matrix, the more abundant is the mineral. These veins meet near the most convex part of the hill, when they expand into a bed, equal to 100 feet wide, constituting the prodigious mass of ore known by the name of "El Rosario" (the Rosary), the discovery of which was at the time deemed so miraculous, that it was attributed to the special intervention of the Virgin, and of course dedicated to her. A belt of hard stone, from three to four feet wide, extends across the hill from north to south, intersecting the veins. Beyond this line the quicksilver does not pass.

The two veins above mentioned are the only ones worked at Almaden, and they have already been dug to such a depth that the drainage has become the heaviest item in the expense. Should steam be applied, this charge will, however, be materially reduced. Thrice, during the late contest, was Almaden taken by the Carlists. The last time they partly destroyed the machinery; but, if Spain ever settles down into a state of tran-

quillity, this undertaking will, in all probability, be conducted on a new plan. Hitherto the labouring department has been carried on by *presidarios*, or convicts, each of whom costs the government at the rate of eight rials, or two shillings, per day, whereas the peasants would perform the same drudgery for less, and, besides, do double the work. This appropriation of men condemned by the laws of their country is, in other respects, impolitic. It gives to a valuable mining district the character of a penal settlement, more abhorred than the dungeons of Ceuta, or the galley stations as they were conducted under the old *régime*.

The quantity of ground bored for shafts, and formed into caverns or resting-places for the miners, who descend in buckets or by means of ladders, has not been properly ascertained, but it is known to be immense. Scenes of the most terrific kind have sometimes occurred within these gloomy recesses, as may be easily imagined, from the nature of the toil and the class of persons by whom it is performed. Soon after the junction of the two veins in the manner previously noticed, owing to the confined state of the air, the gaseous exhalations caught fire, when numbers of the miners perished. The natives speak of this awful visitation in the most painful terms. The risk of another conflagration has since been obviated by means of additional shafts, which improve the ventilation and render the approaches easier.

Rich as are many portions of the Sierra Morena in vegetable and mineral productions, including lead and silver, there is no part of that extended range more curious and interesting, or better adapted for the study of natural history, than Almaden. The scenery is exquisitely picturesque, and occasionally majestic, although it does not embrace those stupendous precipices which mark the same mountain chain in the neighbourhood of Almuñadel and other elevated places, where the vulture nestles above and the wolf prowls below. In La Mancha the range of hills is comparatively low, but the *madronno*, or strawberry-tree, the *coscojo*, or dwarf oak, the *spino*, or thorn-tree, and other plants bearing a brown and shining foliage, the distinctive feature from which the appropriate appellation of the *Sierra Morena*, or Brown Ridge, is derived, are, nevertheless, seen in abundance. The earth, in fact, teems with natural curiosities only half explored. As before noticed, incidents of the most extraordinary kind have occurred here, and yet, even in the fanciful regions of Spain, Almaden was never famed in either poetry or romance. Not so the quicksilver mines of Idria. In them the Austrian Government has been in the habit of condemning its political enemies, sometimes men of family and rank, to toil; and it was an incident of this kind, in the person of a count, which furnished the idea of the dramatic poem called the "Mine."



Instances like the one recorded in that piece are not, however, met with at Almaden. Seldom does it happen that Spanish nobles, or persons of high condition, are so far debased as to be put on a level with plebeian felons, even when their crimes have been equally enormous. Justice in Spain does not wear so stern a front. The *forzados*, or convicts, sent to Almaden, are persons of the lower order, chiefly smugglers, bandits, or murderers, who would otherwise have been employed as galley-slaves, or, chained two and two, compelled to drag out a miserable existence in the dock-yards. The history of some of these offenders would afford ample scope for the pen of a novelist. Remarkable cases of heart-rending misery and oppression have also occurred in these abodes of wretchedness.

The system of compulsory labour is rendered more expensive to the government by the circumstance of its being necessary to have large establishments, besides a military force kept constantly on the spot. In spite of the vigilance displayed by the authorities, mutinies of the most desperate and bloody kind have occasionally broken out. It has, however, been ascertained, that the mercurial exhalations are not injurious either to man, beast, or plants. The native residents, who chiefly derive their livelihood from the mines over which their dwellings stand, enjoy good health, and sleep on a bed of cinnabar without the slightest apprehension. Bowles remarks, that in his time the working convicts, as a body, were a robust race, liable to no incidental diseases, and faring better than the common peasants. They are only compelled to work three hours in the day, besides having the advantage of the numerous holidays marked in the Spanish calendar ; and yet, from mistaken notions of humanity, this kind of labour has been represented as a punishment worse than death. An assemblage of more depraved and obdurate characters, with some exceptions, cannot well be imagined. Many are old offenders—men who, in other countries, would have been sent to the gallows, but who possessed the small sum requisite to bribe their judges, or escaped condign punishment through the *empenno*, or intercession of some powerful advocate at court.

Instead of serving the purpose of a penitentiary, and affording to a frail or deluded youth the opportunity of reflecting on his situation and correcting his errors, this establishment becomes a school for the propagation of vice and debauchery. There is no chance for amendment. The convict prisons are, in fact, infinitely more dangerous to young men than the slave-barracks among the Algerines were in the time of Cervantes ; nor can the mixture of ages and the confusion of crimes be contemplated without feelings of horror. In no country is the code of criminal laws more defective than in Spain ; nowhere is the scale of punishment more imperfectly adjusted to the standard of equity



and expediency than in those tribunals which furnish workmen for the king's quicksilver mines.

The disparity of punishment is particularly glaring. A number of criminals, whose offences are of different enormity, are huddled together, and the same punishment awarded to them without the slightest distinction. Hence it is impossible that the effect contemplated by the legislature can be produced. Punishments should be proportioned to the guilt of the offence committed, for, when excessive and strictly inflicted, they render men desperate, and lead to more dangerous crimes than those which it was wished to prevent. This is the case with the Almaden convicts. When their period of servitude ends, these wretched beings are again let loose on society, infinitely more vicious and depraved than when they entered on their apprenticeship.

To describe the habits of these proscribed members of society, or to sketch the manner in which they employ the large amount of leisure time on their hands, would be an unpleasant task. The picture, besides, would be revolting to an English eye. Suffice it to say, that no moral precepts are instilled into their minds—no proper books circulate among them. Their overseers consider them in no other light than as labourers, valuable only according to the quantity of work that can be wrung from them in a given time, which, however, has been so limited as to prevent great abuses. Contamination is the misfortune of this system, and hence it often happens that the most desperate banditti infesting the roads are convicts who have returned from Almaden. Among them ingenious impostors may frequently be seen. Some feign to be afflicted with paralytic disorders, which they attribute to the nature of the work; but in most instances their motive is to avoid the task assigned them, or to extort alms from the compassionate.

It is therefore to be hoped that the Spanish Government will be induced to abandon the unjust and inefficient mode of working their quicksilver mines by means of compulsory labour. It would be the interest of the mortgagees to see that this is done, more particularly as other workmen can easily be had. On the score of expense, the saving would also be considerable. In the district of Almaden there is ample scope for the regular pursuits of mining, without defeating the ends of justice. At Almadenejos, about two leagues distant from the town of Almaden, another quicksilver mine was discovered in the year 1755, but the works did not commence till 1780. In the province of Valencia, two quicksilver mines were discovered towards the middle of last century, but this article being a crown monopoly, no attempt was made to work either of them. The one is situated in the limestone mountains of Alcoray, a short distance from Alicant, and the other in the highlands between Valencia

and San Felipe. The city of Valencia is built on a bed of cinerous clay, about two feet in thickness, which traverses it from east to west, passing under the house of the Marquess de Dos Aguas, situated on the square of Villarosa, where, as an experiment, a shaft was sunk, and good samples of quicksilver brought up. For the reason above alleged, this experiment was carried no further; but, beyond all doubt, quicksilver may be had in the province of Valencia, although not so abundantly as at Almaden. It is situated on one of the declivities of a ridge of hills running between two rivulets, the one called Val de Asogues (Valley of Quicksilver), and the other Gargantiel, which, a quarter of a league further on, form a junction.

The spot on which the new mine stands was originally a secluded heath, forming part of an estate belonging to the military order of Calatrava, from whom it was taken and incorporated with the crown monopoly. Every encouragement was given to persons to settle upon this ground; a chapel and an hospital were erected, and soon afterwards smelting-furnaces constructed. Almadenejos, or, as it may more properly be called, Little Almaden, soon grew into a village of 1,300 inhabitants; and so important was the place considered, that it has since been encircled with walls, having one gate opening to the east and another to the west. The produce of the new mine, in some years, has equalled 12,000 quintals, but varies according to the number of hands employed. On an average it is 3,000 quintals.

The cinnabar, or mineralized mercury, presents itself under various forms, of which the striated is perhaps the most beautiful. Usually it is combined with sulphur, when the ore assumes a bright red, or vermilion colour. It also appears purely embodied in slate, mixed with calcarious spar, crystallized with sulphur, blended with quartz, and often an ironized mineral forms the matrix. Mercurial pyrites, of a yellow or sulphurous colour, are found, extraordinary in their size, and easily dissolved, which, when broken, exhibit particles of mercury. White quartz, richly ramified with cinnabar, is also met with; and occasionally crystallines are dug out, either lamellated, or in the form of rubies. Slate is seen streaked and dotted; and, lastly, pure quicksilver is collected among the breaks and in the crevices formed by the mouldering sandstone, even on the surface. The quantity of half-burnt scoria, left in heaps round the furnace sheds, is immense, of which, in any other place, a large portion might be worth passing a second time through the furnace.

If the mode of working these mines is injudicious, the process adopted for the preparation of the ore is equally so. The Spaniards, generally speaking, in their improvements, have not kept pace with other nations, and this is particularly visible in

their agricultural and mining enterprises. Prejudices have a stronger hold upon them than any other people in Europe. Retorts were used by the Germans for smelting the Almaden ore, as may be seen from the fragments scattered about on the hill; but, as before noticed, furnaces on the reverberatory principle were, after their time, introduced; and since that period scarcely have they undergone any change. In form, the one still used resembles a well-constructed limekiln, excepting that the chimney is placed in the front wall, in order that the flame may spread more equally over the surface. The mineral is heaped up in layers, and the top covered with clay, or a glutinous earth, in which are inserted a given number of aludels, or receivers, placed in an inclined position. A fire is then lighted with faggots, made of the aromatic shrubs with which the neighbouring heaths abound, and kept constantly fed. The blaze created by the resinous stems is intense; and when the mass with which the furnace is charged becomes heated to a proper degree, the volatile sulphur and mercury escape together and pass into the receivers, where the latter condenses and cools, and, being the heaviest, falls into vats ranged underneath to receive it.

Nitre and charcoal, pounded together, are sometimes mixed with the mass, in order to add to the intensity of the heat; but the loss of the metal is, nevertheless, great, as may be seen from the heaps of scoria, in which particles of mercury are found, blended with quartz, sulphuretted ochre, and ferruginous ore. The process is, besides, slow, as it takes nearly three days to smelt the contents of a furnace—usually about 2,000 lbs. of mineral, yielding, on an average, one-fourth of pure metal. Where the vein is particularly rich, there have been instances of one pound of ore yielding ten ounces. After the scoria has been removed, the furnace undergoes a thorough repair, the injury caused by the heat being always considerable. During the summer months the operation of smelting is suspended.

The quicksilver is collected in oblong troughs, built up with masonry, but the weight more than once has been so great as to burst the enclosure, when the metal was seen coursing down the hill in streamlets and globules. In this manner quantities have been lost beyond the power of redemption. Formerly, quicksilver, like wine, was packed in goat-skins; but this method, more particularly when intended for shipment, was found unsafe. At present it is put into thin cast-iron bottles, in shape resembling an imperial quart bottle, only larger, with half the neck cut off. To these bottles, each of which (filled) weighs about 75 lbs. net, there is no handle, which renders the dead-weight extremely inconvenient. The mouth is secured with a screw, fitted in like the stopper of a decanter, excepting that the top tapers to a fine edge, so as to enter a hand-vice, by means of



which a purchase is obtained to force the screw when it is rusty, or has been wound round too tight. These bottles, called by the Spaniards *frascos*, are made in the Basque provinces, chiefly at the foundry of Iraeta, a beautiful estate belonging to the Duke de Granada, on the road from Azpeitia to Cestona. This establishment is situated on the river Urola, about half a league from the port of Zumaia, on the Guipuscoan coast, where the bottles are shipped for Seville. Here they are filled at the Almacén del Azogue (the government depôt), to which the quicksilver is brought down from the mines in skins, where it is emptied into wells, or troughs, and there kept till wanted for shipment.

It would be useless to burden the pages of this work with returns of the produce of the Almadén mines, such as they have been published for financial purposes by agents of the Spanish Government. It may suffice to say, that, since the Spaniards became exporters of quicksilver, and entered into competition with the Austrians, they have never allowed more to be taken from their mines than from 20,000 to 25,000 quintals per annum, although much more might have been obtained. In this restriction they acted from motives of policy, fearful that the market might be glutted, and the price, consequently, reduced.

The uses of quicksilver in England are too generally known to require any specific enumeration in this place.

The great consumption of the article is in the South American mines, and in that light it is that the subject has become so interesting to the British public; for, since the independence of the *quondam* colonies of Spain, the supplies are chiefly furnished (of course second-hand) from England, and our countrymen, besides, have a large stake in the mining enterprises of the New World.

Humboldt says that the quantity of mercury annually consumed in Mexico is equal to 2,000,000 lbs. weight, or 734 tons, and that all South America consumes about 25,000 cwt.,\* or 1,250 tons, valued at 250,000*l.* sterling. The quantity and value may not be accurately stated. Since Humboldt's time both may have varied materially; but it is, nevertheless, a fact, that in this way the largest quantity of the mineral fluid is disposed of, and it has always been a maxim with the Spanish Government to keep the produce of the Almadén mines, as much as they could, under the demand for South America. The ministers in Madrid, no matter the party to which they belonged, were always inclined to act the part of monopolists, and in this respect circumstances have favoured them, more particularly of late years.

Competition has been limited, for the Idrian mines do not

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\* It is usually landed at Vera Cruz and Tampico, although small parcels are sometimes sent round Cape Horn to the western coast.



annually yield more than 150 to 170 tons of quicksilver—a portion of which is expended at home, and the rest chiefly finds its way to China. That used in the country is packed in bags made of sheep-skins, whereas the remainder intended for shipment is put up in cast-iron bottles, weighing 65 lbs. each when filled. The average price is 109 to 112 florins for 100 German lbs.; but even at this comparatively low rate, the quantity sent to South America is trifling. There, besides, it is not considered so good as that procured from Almaden; but, whatever may be the country from which the supplies originally come, as mercury is avowedly indispensable for the extraction of silver (at least, till some new process can be discovered), it follows that the quantity of the precious metals obtained does not depend so much on the richness of the ores as on the cheapness and abundance of the quicksilver with which the mines are supplied; and this position we believe cannot easily be controverted.

The precious metals, and more particularly silver, are seldom discovered in a metallic state, although occasionally it does happen that a small lump of pure silver is met with, called by the miners a *pepita* (kernel), of which a few beautiful specimens from the Pasco mines have been brought to England. Generally both silver and gold are in a very small proportion combined with other metals, such as arsenic, antimony, copper, &c., and at the same time mixed with various earthy substances. So small, indeed, is this proportion in the ore dug out of the Mexican mines, that it seldom exceeds five ounces in each quintal, or 100 lbs., and it has been remarked that, in Peru, the proportion is still less. In Germany, if from seventy to eighty ounces can be procured from a ton of ore, the miner is satisfied with his requital. The great difficulty therefore is, how to collect and detach from the surrounding mass of worthless matter the scattered particles, imperceptible as they are to the eye, of the valuable substance contained in any given quantity of rough ore.

Two modes of attaining this object have been discovered and practised; the one ancient, and the other comparatively modern—the one by a fire process, and the other by the combined operation of water; or, to speak technically, in the dry and wet way. The first process is by submitting the pulverized ore, mixed with the oxides of lead, to the action of heat, when the reduced or liquefied lead attracts to itself, and, as it were, subdues the particles of silver or gold dispersed in the mass with which the furnace is charged, and from which it is afterwards separated by a second process, called cupellation; that is, by refining the silver-lead and drawing off the litharge by means of a smelting-furnace, purposely constructed. This mode was adopted in the very earliest times; nay, with all their science, the Romans knew no other. In this respect they were not even

more advanced than the Indians of Peru, when discovered by the Spaniards.

The second process, which has in great measure superseded the first, is by amalgamation ; that is, by mixing the wet powdered and sifted ore with salt, quicksilver, and other re-agents, when the mass being exposed to a fire heat, or to the action of the sun, the silver and gold enter into a chemical combination with the quicksilver, cohering and forming what is called an amalgam, or paste, from which the mercury is afterwards withdrawn by fusion.

The contracts with the Spanish Government for the exclusive sale of the Almaden quicksilver had for some time been held by Bordeaux houses ; but, during the great fluctuations in the Madrid ministry, it was natural to expect that competitors would enter the lists. Accordingly, under the Toreno administration, and at a moment when the pressure on the Treasury was severely felt, notice was given that tenders for a new contract would be received, and the preference fell to the lot of Messrs. Rothschild.\* Since that period the annual contract, with few exceptions, has been held by that eminent firm.

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## THE LEAD MINES AND MINERAL LAWS OF DERBYSHIRE.

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THE mines of Derbyshire, although yielding but an inconsiderable produce at the present period compared with earlier times, possess considerable interest from the extent to which they have been worked, the various proofs afforded of their ancient origin, and the peculiarity of the laws by which they are governed.

At Castleton is the Odin mine ; which it is conjectured was so called after one of the Danish deities, while tradition states that this mine was worked by the Saxons about the close of the sixth century. The vein here, is that called a rake vein, running from east to west, and underlying, or *hading*, south. The operations, which were conducted horizontally, have been carried more than a mile in length from the entrance, and to a considerable extent both below and above the adit. The vein varies in thickness from four inches to eight feet ; and the ore, which has yielded 60 per cent., is found in great quantities, with

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\* Count de Toreno was appointed Finance Minister towards the close of 1834.

many fine crystallizations. The adit is driven in limestone, and after passing through shale, enters again into limestone.

In proof of the lead mines of Derbyshire having been wrought by the Romans, we have the authority of Dr. Millar, who states, "that in the year 1777 a pig of lead was found on Cromford Moor, and the interpretation of the inscription is 'The sixth legion inscribes this in memory of the Emperor Adrian.'" Several others have also been found at different periods; one about the year 1790, weighing twelve stone, was found at Matlock, bearing the following inscription—"TI. CL. TR. LUT. BR. EXARG.," which are supposed to be the abbreviations of "Tiberii Claudiani Triumviri Lutudari Britanniorum Exargentaria."

The Gregory mine, in Ashover, from the year 1756 to 1786 yielded 1,500 tons of lead, upon an average worth, at the then price of lead, upwards of 100,000*l.*, but in consequence of low prices and small demand, combined with the fact that the ore is found in less quantities (the veins becoming less), in proportion as the mine descends beyond 200 yards, it has been unwrought for seventeen years. This mine has been worked in the first limestone, first toadstone, and second limestone; the workings were in nearly the following measures; alluvial, 4 yards; blue bind, 16; shale, 200; first limestone and toadstone, 62; black bind (blackstone clay), 40; and in the second limestone, 32; the entire depth being 354 yards. The veins of lead ore are mostly found in the limestone, or basaltic strata called toadstone, but almost always strike a considerable way into the sub and super strata, whether shale (micaceous schistus), bind, or grit, so that the Gregory mine is said to find lead in grit, shale, and limestone. The vein-stuff, or matrix, is fluor-spar, crystals of calc, slickensides, indurated bitumen, blue John (of which the beautiful ornaments of Derbyshire spar are mostly made), &c. Elastic bitumen, or mineral caoutchouc, is not uncommon in the mines, and is found between the schistus and the limestone, as well as in small cavities; and it may be remarked, as a singular fact, that the fluor-spar which forms so great a portion of the matrix in lead veins in Derbyshire, has scarcely ever been found in the lead mines of Scotland. The veins of ore under and above the toadstone seldom run parallel, or in a line with each other, and never of the same thickness; but the deviation is but small, and something in a curved form, so that the points of the curves are frequently in a line parallel to each other.

The limestone strata contain a great number of mineral veins, which are of distinct kinds; the most common, as well as the most numerous, is the *rake* vein, which is a vertical crack, or fissure, filled with ore, spar, &c.; they usually keep a pretty straight course on the surface, running parallel to each other, and frequently have small pipe-veins crossing them at



right angles. The *pipe* vein is an horizontal cavity between the beds of limestone, filled with the usual matrix of barytes, fluor-spar, lime-spar, manganese, &c., usually accompanied by a narrow rake vein, or rake leading to or from it; sometimes, although but rarely, a *flat* rake is found—an horizontal cavity filled with ore and vein stuff, but which has no accompanying rake. When lead is found in detached masses, it is usually accompanied by quartz, clay, &c.; but spar seldom forms a component part.

The prevailing ores of this county are galena; sulphuret of lead, crystallized in cubes and hexagonal pyramids, frequently occurs, and slickensides, which is said to be a species of galena, is not uncommon, but which may, indeed, be nothing more than the fracture of leaf ore; it presents a smooth surface, which gives out a strong reflection, forming a thin plate, and usually adhering to cawk, or sulphate of barytes, which latter possesses the peculiar property of spontaneous explosion, when first laid bare, or exposed to atmospheric action. To avoid the danger attendant on working in its immediate contiguity, the miners use the precaution of merely making a small incision or aperture, with the point of the pick, and then retire to a place of safety, awaiting the result. In case of an explosion, it generally takes place in ten or fifteen minutes, and by the force attendant on which, considerable masses of ore, and even stuff, are detached.

The mining laws in force apply only to that part of the county known as the King's Field, or Hundreds of High Peak and Worksworth, extending to Crich, with a few modifications or exceptions; it has, however, been contended that the mining rights of the Crown are confined to such land manors as belonged to the Duke of Lancaster, and that these laws have no legal application to such estates as did not form part of that duchy. In the King's Field certain officers are appointed, called bar-masters, who hold mineral courts, at which a jury of twenty-four men decide all questions or disputes regarding the *cope*, or duties payable to the king or his men, or lessee, and who have also a power of determining all disputes or questions, and, in certain cases, of enforcing the payment of debts incurred in the working of mines.

These laws, which evidently originated in the very infancy of mining, are confined to the working of mines by manual labour only, and hence some of the customs necessary to be observed, may be considered as obsolete, or rather as a mere matter of form. Upon a person finding a vein of ore, the laws require him to make a cross on the ground, as a mark of possession, giving notice at the same time to the bar-master, who attends and receives a measure or dish of ore, being the first produce of the mine; this appears to be a preliminary condition for



allowing him to proceed in working his *meer* or measure of twenty-nine yards in length of vein, the bar-master at the same time taking possession of the next half-meer for the king (of fourteen and a half yards), which, after being valued by experienced persons, is invariably sold at 10% to 100% to the adjoining meer-holder. If the vein promise well, applications are made for the next meer, the same form being observed, and when there are a number of partners concerned in working the vein, they are termed *grove fellows*. The mining laws require not merely the discovery of a vein of ore (of which there are many which carry little or no lead), but one that has been worked so far as to produce the king's dish.\*

The mode pursued in working the first mines was all open work, commencing at the loom-soil; mattocks, picks, hammers, and wedges were employed in loosening the ore and spar, the latter being thrown on each side their bowse, and having proceeded in this form as deep as was practicable, it became necessary to erect *stowses* or windlasses, or rope barrels, on each meer, by which means the refuse was drawn to the surface; and the great number of these open works formerly wrought, give, even at this day, a very unsightly appearance to some parts of the peak. A number of meers were thus worked at the same time in lines parallel to each other, strict laws being made and enforced by the Mineral Courts, to prevent the occupiers of the soil from levelling or meddling with these dangerous and unsightly apertures or ditches. As the mines, however, increased in depth, horse-gins were erected for drawing the ore and water, and the mines or *meers* became consolidated by the property of them being united, the meers being also connected below the ore and vein, were then carried to particular shafts to be drawn to the surface. Prior to this time, the Mining Laws required a working *stowse*, and its actual use, once in three weeks, in drawing ore on each *meer*, but in time became so far relaxed as to allow models of *stowses*, or sham drawing apparatus, which is provided by the bar-master, and is used to keep possession of the meers on a consolidated mine, and is even now so rigidly enforced, that a mine on which steam-engines and gins are erected, is not held to be legally occupied except one of those pigmy memorials of the ancient mode of drawing ore is constantly kept "in sight of all men." These laws punish by fines all men detected removing the bar-master's *stowses*, even if placed in the middle of a cultivated field, a common, or a fence wall. These models, to be

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\* A dish of ore, Low Peak, is a rectangular box, twenty-eight inches long, six inches wide, and four inches deep, and will hold fourteen Winchester pints. High Peak, the dish is sixteen pints: every twenty-fifth dish belongs to the king. The tithe varies, but in most cases is one-fortieth, and there is also in the King's Field one-fortieth due to the lord of the manor, but which also is subject to some variations.

legal, must have no nails in their structure, as primitively made. The bar-master charges a small sum for these *shams*, and the miners are obliged to be particular in replacing them when broken or destroyed.

The principal minerals in the King's Field, to which these laws have reference, are lead, zinc, manganese, copper, iron ores (resembling the rich hematitic ores of Ulverstone), fluor, barytes, chert, china clay, and calcarious matters.

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### UPON THE MODE OF DETERMINING THE QUANTITY OF COPPER IN ORES AND SMELTING PRODUCTS BY THE HUMID WAY.

*As practised at the Laboratory in the Royal Metallurgical Works  
at Freiberg.*

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THE copper assay by the dry way belongs to those operations of assaying from which it is desired that the most true and accurate results may be given, but it proves imperfect in the examination of ores and smelting products, which yield only few per cent. of copper, and which, besides, consist of nickel, cobalt, iron, antimony, and other metals of this kind : therefore, if the question was to learn the real richness of copper in any ore or smelting product, I have always chosen the humid way and precipitated the copper from the solutions of substances under examination, by employing sulphuretted hydrogen. The sulphuret of copper, if only small quantities of it were obtained, was converted into an oxide by calcination, under the cover of a muffle ; if more, then it was digested with *aqua regia*, and the dissolved oxide of copper was precipitated on introducing caustic hydrate of potass into the heated liquid. But this process is rendered still more circumstantial, should the substance contain lead or silver (without the removal of which from the solution, the precipitation of pure copper cannot possibly take place), and loses much in accuracy and exactness, should, in addition to the already-named metals, antimony and arsenic be contained in the substances, whose richness in copper is to be determined, as, for instance, in *bleystein*, containing copper and other metals.

The process introduced in the laboratory of Mr. Sefstrom, and the Gustav silver smelting-house, at Fahlun, for determining the quantity of copper in copper ores, which, from the experimental assays since made, proves itself so admirably adapted for the

purpose, not only enables the assayer to find out the quantity of copper contained in ores of poor quality, but also in ascertaining the same, with the greatest ease and accuracy, in copper, scoria, &c. The process consists in general of the treatment of the substances containing copper, with concentrated sulphuric acid, and precipitating the solution obtained with metallic iron.

Although it may seem to require but little explanation, the success of an assay will be found to depend much on address, and a strict observance of the rules practice has laid down is strongly to be recommended. In order to obtain an average assay of the ore or product, any discretionary quantity is to be pounded in the mortar, the same as every other copper assay. A small portion of the powder is then again pounded in a mortar of steel or calcedony, and from three to five grammes\* taken away and weighed; this powder is now brought into a bolt-head, the neck of which must be broken off, having a height of two and a half to three inches, and then mixed with three-fourths of an ounce of concentrated sulphuric acid. In order to avoid weighing the sulphuric acid, they make use of a pipette, with India rubber. Any number of such bolt-heads are placed in the sand-bath, which is filled an inch in depth with sand, and stands either in the open air or in a good draught. The fire under the sand-bath is to be gradually kept up till the sulphuric acid boils, and so till all steam from the sulphuric acid disappears, and the mass has become dry; six to twelve hours, according to the nature of the substances to be assayed, will be found necessary. In each bolt-head, one then pours twenty drops of sulphuric acid. After half an hour's digestion, the mass in the bolt-head can be poured over with hot boiling water, and then rinsed in a warmed precipitate glass. While the fluid is still hot, filter it likewise in a heated precipitate glass, and pour boiling water on the insoluble sediment till the whole solution amounts to two pounds. The precipitation of copper now takes place. An iron or steel plate is then used, from eight to nine inches long, filed square, and about a quarter of an inch thick; on this occasion, however, before employing the same, it must be wrapped up in paper and laid in the sand-bath to get hot. As soon as the hot copper solution is stirred with the bar, a strong ebullition of the hydrogen gas follows, and metallic copper will be precipitated. During the precipitation, one must cover the precipitate vessel with a plate of glass. If no more hydrogen gas is evolved, and the previous greenish-blue solution has become colourless, which generally takes place in one hour to one hour and a half, the precipitation which must take place in the sand-bath is completed. If the fluid has been properly thinned, and reddened the litmus-paper,

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\* The gramme is equal to 15.444 English grains.



and is hot, no copper generally will be found attached to the iron bar, it having detached itself and fallen to the bottom of the precipitate glass. The iron appears, as far as it has been immersed in water, to have covered itself with a thin coat of carbon. This is transferred with a camel-hair brush into the liquid, and after washing it in this manner, dry, and quickly polish it with a fine file. The liquid is now decanted from the precipitate glass in which the copper lies, as long as the same can be managed without loss, and the precipitate glass is again filled with hot water, till the copper, by this process, has become quite pure. Through repeated decantations all particles of carbon which have loosened themselves from the iron plate during the precipitation of the copper will be entirely separated from the last, and appear as a uniform powder, of a beautiful red copper-colour. After the last cleansing of the filter, the copper is brushed with a fine camel-hair brush, or the beard of a quill, into a prepared filter; dry the same at 100 degrees, and determine the weight of the metal. With small quantities of copper, instead of filtering, it is washed in a previously-weighed watch-glass, drawing off the small quantity of water by a pipette. The rest is then evaporated, and the metal weighed after drying it; the sooner this takes place the better, as the metal is easily affected by moisture of the air. A precaution necessary to be observed in the management of the operation above described, is the avoiding of all such circumstances as tend to produce or accelerate a higher degree of oxidation of the dissolved iron in the solution. It is therefore indispensably necessary, as I have many times convinced myself, in order to insure success to the experiment—

1. That hot water, as free from air as possible, be used to soften the said ore that has been treated with sulphuric acid.

2. That the solution of copper be highly diluted, and reddened litmus-paper. The precipitation of copper is hastened by adding a few drops of sulphuric acid to the liquid.

3. That the precipitation be made while it is warm.

4. That the iron be well polished and heated before using.

5. That the precipitated copper be quickly removed from the liquid above it, and in washing the same hot water be used. A copper assay of the above description requires two days for performance; one can, however, very conveniently, during this time, prepare twenty-four; when one has several of the same to make at once, it is advisable, in filtration, to make use of a shelf similar to that used with the re-agent glasser, on which each individual hole for the reception of the funnel is numbered. It is also desirable, to avoid confusion, to number the glasses in which the copper is precipitated. Should it be wished to determine the richness of copper-slate in copper, through these means, which are well suited for the purpose, it is necessary to heat the



same red-hot, in order to drive off the bitumen. If it is supposed that the substance is not, perhaps, perfectly decomposed by the sulphuric acid, for safety's sake we might put some drops of *aqua regia* to the dried-up mass, before it is mixed with a second portion of sulphuric acid. This will happen, however, very seldom, for all those ores and smelting products tried, by this method, were always perfectly decomposed by the sulphuric acid, after they had been ground to powder, and a sufficient quantity of sulphuric acid applied; also, when the washed residuum was treating in solution with *aqua regia*, the least signs of copper could never be detected, examining and treating the solution with ferro-cyanite of potassa, ammonia, and iron. If metallic sulphur, as, from the lead process (bleystein and bleispels), containing copper, are submitted to this assay, the component parts of lead and iron give in the state of sulphate a white or yellow residuum, so that the solution will scarcely contain anything else but sulphate of copper.

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### ON ACCIDENTS IN MINES.\*

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IN our last volume we alluded to the fearful loss of life incurred in the different mines and collieries at that time; we mentioned it had attracted the attention of the legislature, commissioners were appointed, and a mass of evidence has been produced, but as yet little practical good has been effected, and it would appear, while every other interest has its advocates, the working miner, of all the labouring classes, is the most neglected by the legislature, which ought to protect him. Notwithstanding the precautions which are said to have been taken to prevent the frightful recurrence of these awful calamities, we find that in the past year the number of accidents has been 406, being three more than in the preceding year. A singular coincidence will be observed on referring to the tables of 1848, that the number of deaths in that year were the same, viz. 567; the injuries were, however, considerably greater, being increased by 102. On comparing the tables, it will be found that accidents resulting from machinery are much less than is generally imagined, those from

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\* The following are abbreviations of the terms employed in the several tables accompanying the present paper:—Exp. Explosion of Fire Damp or Carbonic Gas.—F. R. Fall of Rock or Coal.—Co. Colliery.—F.S. Fall in Shaft or Pit.—I.W. Iron Works.—A.S. Accident in Shaft or Pit.—Ma. Machinery.—M. Mine.—Ac. Accident.—Qu. Quarry.

explosions and fall of rock comprising the majority. Having previously dilated on the importance of some steps being taken by those interested to ameliorate the condition of the working miner, any lengthened remarks would be but a recapitulation of our so often expressed opinions on this subject, whether in the *Mining Journal* or through the present medium; we have therefore only to submit to our readers the statistical information which has been compiled, giving the returns for the years 1848 and 1849.

1848.			DEATHS.						INJURIES.						
			Ex.	F.R	F.S.	Ma.	Ac.	Total.	Ex.	F.R	F.S.	Ma.	Ac.	Total.	
January	..	..	12	18	16	7	..	53	14	3	3	1	8	29	
February	..	..	36	21	15	17	..	89	18	3	2	4	..	27	
March	..	..	16	17	7	5	..	45	3	6	2	2	2	15	
April	..	..	51	15	12	3	2	83	17	6	2	..	1	26	
May	..	..	5	11	2	4	1	23	6	2	..	..	..	8	
June	..	..	22	11	2	2	2	39	6	..	..	5	1	12	
July	..	..	..	5	4	4	3	16	10	4	1	..	2	17	
August	..	..	47	13	1	2	6	69	12	4	..	1	..	17	
September	..	..	12	9	4	7	..	32	6	3	2	..	..	11	
October	..	..	10	8	3	4	3	28	11	2	..	3	..	16	
November	..	..	34	15	4	..	3	56	1	5	1	2	..	9	
December	..	..	11	20	..	..	3	34	26	17	..	..	9	52	
Total			..	256	163	70	55	23	567	130	55	13	18	23	239

1849.			DEATHS.					INJURIES.						
			Ex.	F.R	F.S.	Ma.	Ac.	Total.	Ex.	F.R	F.S.	Ma.	Ac.	Total.
January	..	..	84	10	6	..	7	107	..	4	4	..	4	12
February	..	..	4	4	5	..	..	13	5	..	3	..	..	8
March	..	..	24	13	6	1	1	45	15	7	10	..	1	33
April	..	..	11	17	5	1	..	32	20	11	..	5	1	36
May	..	..	6	18	9	5	4	44	11	7	13	..	1	29
June	..	..	69	16	10	1	6	102	74	7	1	1	1	87
July	..	..	18	11	14	..	5	48	17	1	..	..	3	21
August	..	..	17	9	4	2	2	34	3	1	4	..	..	8
September	..	..	10	11	12	..	5	38	17	6	..	1	1	25
October	..	..	3	11	2	5	4	25	8	7	3	7	3	28
November	..	..	3	13	5	1	14	36	9	..	..	9	1	19
December	..	..	6	21	12	..	4	43	31	1	1	..	2	35
Total			255	154	90	16	52	567	210	52	39	23	17	341

In addition to these we give the monthly returns for the last three years, from which it will be seen that during that period, from various causes, no less than 1,757 deaths have occurred, while the injuries have amounted to 776.

	1847.				1848.				1849.			
	Accid.	Dths.	Injurs.	Total.	Accid.	Dths.	Injurs.	Total.	Accid.	Dths.	Injurs.	Total.
January	44	92	15	107	43	53	29	82	28	107	12	119
February	34	56	15	71	44	89	27	116	14	13	8	21
March ..	49	31	12	43	32	45	15	60	36	45	33	78
April ..	22	48	15	63	40	83	26	109	36	32	36	68
May ..	40	40	8	48	23	23	8	31	40	44	29	73
June ..	50	44	13	57	39	39	12	51	47	102	87	109
July ..	37	80	15	95	21	16	17	33	37	48	21	69
August ..	38	46	25	71	32	69	17	86	28	34	8	42
Septemb.	51	26	19	45	31	32	11	43	32	38	25	63
October	60	60	40	100	26	28	16	44	33	25	28	53
Novemb.	39	57	5	62	31	56	9	65	35	36	19	55
Decemb.	24	42	14	56	41	34	52	86	40	43	35	78
Total..	488	623	196	819	403	567	239	806	406	567	341	908

Although these probably furnish all the statistical information which may be required, we prefix the causes which have led to this awful waste of human life.

Date.	Number of Accidents.	DEATHS.						INJURIES.						TOTALS.	
		Exp.	F.R.	F.S.	Ma.	Acc. not specified	Total.	Exp.	F.R.	F.S.	Ma.	Acc. not specified	Total.	D.& Inj. Weekly.	Monthly amount.
1849.															
January	6	9	..	1	3	..	4	8	..	2	3	..	1	6	14
13	2	..	1	1	..	..	2	2	..	1	..	..	1	1	3
20	8	..	5	1	..	..	2	8	..	1	..	..	1	2	10
27	9	84	3	1	..	1	89	..	..	1	..	2	3	92	119
February	3	2	..	1	1	..	2	..	..	..	..	..	..	2	2
10	2	..	..	..	..	..	..	..	..	3	..	..	3	3	3
17	4	1	1	2	..	..	4	..	..	..	..	..	..	4	4
24	6	3	2	2	..	..	7	5	..	..	..	..	5	12	21
March	3	6	9	3	..	..	12	9	..	..	..	..	9	21	21
10	3	13	..	..	..	..	13	2	1	..	..	..	3	16	16
17	12	..	3	3	..	..	6	4	5	2	..	1	12	18	18
24	7	1	2	1	1	..	5	..	1	1	..	..	2	7	7
31	8	1	5	2	..	1	9	..	..	7	..	..	7	16	78
April	7	14	5	6	1	..	12	9	6	..	..	..	15	27	27
14	6	1	4	2	..	..	7	7	..	..	..	..	7	14	14
21	4	3	2	..	..	..	5	2	2	..	4	..	8	13	13
28	12	2	5	..	1	..	8	2	3	..	1	..	6	14	68
May	5	12	3	6	2	1	12	8	..	..	..	..	8	20	20
12	11	..	3	..	3	3	9	2	1	1	..	1	5	14	14
19	10	..	6	..	1	1	8	..	3	..	..	..	3	11	11
26	7	3	3	9	..	..	15	1	..	12	..	..	13	28	73
June	2	9	..	1	..	..	1	2	4	3	1	1	..	9	11
9	11	32	4	5	..	2	43	1	3	..	..	1	5	48	48
16	8	..	2	2	1	1	6	3	..	..	..	..	3	9	9
23	5	2	2	..	..	1	5	4	1	..	..	..	5	10	10
30	14	35	7	3	..	1	46	62	3	..	..	..	65	111	189
July	7	10	3	2	..	..	6	15	1	..	..	..	1	17	23
14	12	1	7	2	..	3	13	..	..	..	..	1	1	14	14
21	6	11	..	1	..	..	12	2	..	..	..	1	3	15	15
28	9	3	2	11	..	1	17	..	..	..	..	..	17	17	69

Date.	Number of Accidents.	DEATHS.						INJURIES.						TOTALS.	
		Exp.	F.R.	F.S.	Ma.	Acc. not specified	Total.	Exp.	F.R.	F.S.	Ma.	Acc. not specified	Total.	D. & Inj. Weekly.	Monthly amount.
1849.															
August	4	10	1	3	2	2	1	9	2	..	..	..	..	2	11
	11	5	7	1	1	..	..	9	..	..	..	..	..	..	9
	18	7	1	3	1	..	..	5	1	1	1	..	..	3	8
	25	6	8	2	..	..	1	11	..	..	3	..	..	3	14
September	1	6	1	3	1	..	..	5	..	2	..	..	1	3	8
	8	3	..	1	..	..	..	1	6	..	..	1	..	7	8
	15	13	5	5	5	..	2	17	10	1	..	..	..	11	28
	22	3	..	1	..	..	1	2	..	2	..	..	..	2	4
	29	7	4	1	6	..	2	13	1	1	..	..	..	2	15
October	6	2	..	..	..	3	..	3	2	..	..	2	..	4	7
	13	10	2	3	..	1	..	6	2	3	1	3	1	10	16
	20	12	..	4	2	1	3	10	2	2	2	..	2	8	18
	27	9	1	4	..	..	1	6	2	2	..	2	..	6	12
November	3	5	..	2	..	..	3	5	..	..	..	4	1	5	10
	10	9	1	3	..	..	5	9	..	..	..	1	..	1	10
	17	13	1	4	4	1	3	13	5	..	..	4	..	9	22
	24	8	1	4	1	..	3	9	4	..	..	..	..	4	13
December	1	4	1	4	1	..	..	6	24	..	..	..	..	24	30
	8	7	..	3	1	..	..	4	3	1	..	..	1	5	9
	15	14	5	7	3	..	3	18	4	..	1	..	..	5	23
	22	8	..	4	3	..	..	7	..	..	..	..	1	1	8
	29	7	..	3	4	..	1	8	..	..	..	..	..	..	8
Total..	406	255	154	90	16	52	567	210	52	39	23	17	341	908	908

The following table gives the various localities and causes of accident:—

Date.	Name of Mine.	Killed.	Injured.	Cause.	Date.	Name of Mine.	Killed.	Injured.	Cause.
1849.					1849.				
Jan. 6	Heaton Colliery ..	1	..	Ac.		Baynalls Colliery ..	..	1	Ac.
	East Cramlington Co. ..	1	..	F.R.		Burnslance Co. ..	1	..	F.R.
	Brierly Hill Co. ..	..	2	F.R.		Aberavon ..	..	1	Exp.
	Hafod Copper Works ..	1	..	Ac.		Lofthouse ..	..	1	F.R.
	Rowley Regis ..	..	2	F.S.		Whitehaven ..	..	1	Ac.
	Bumble Hole Co. ..	..	1	Ac.	Feb. 3	Whiteriggs Pit ..	..	1	F.R.
	Danly Bank Co. ..	1	..	F.S.		West Bromwich ..	..	1	F.S.
	Old Washington Co. ..	2	1	F.S.	10	North Roskear ..	..	1	F.S.
	West Bromwich ..	2	..	Ac.		Mandubeagh Co. ..	..	2	F.S.
13	Willingsworth ..	1	..	F.S.	17	Kingswinford ..	..	1	F.R.
	Sedgely ..	..	1	F.R.		Rowley Regis ..	..	1	F.S.
20	Levant ..	..	1	F.S.		Aberavon ..	..	1	F.R.
	Butterly Co. ..	..	1	F.R.		Stray Park ..	..	1	Exp.
	Plymouth Works ..	..	1	Ac.	24	Pontypoid Co. ..	..	1	F.S.
	Dowlais ..	..	2	Ac.		Clay Cross ..	..	1	F.S.
	Plymouth Works ..	..	1	F.R.		Burnslance Co. ..	..	1	F.R.
	Cwmbargoed Pit ..	..	1	F.R.		Merthyr ..	..	1	F.R.
	Garth Colliery ..	1	1	F.R.		Rowley Regis ..	..	3	Exp.
	Wolverhampton ..	..	1	F.R.		Victoria Pits ..	..	5	Exp.
27	Darley Main Co. ..	83	..	Exp.	Mar. 3	Bird in Hand Co. ..	..	7	Exp.
	Monkwearmouth Co. ..	1	1	F.S.		Capon Field ..	..	1	F.R.
	Whitton Park Iron W. ..	..	1	Ac.		Denbigh Hall ..	..	1	F.R.
	Govie Colliery ..	1	..	F.R.		Merthyr ..	..	1	F.R.



Date.	Name of Mine.	Killed.	Injured.	Cause.	Date.	Name of Mine.	Killed.	Injured.	Cause.
1849.	Bradford .. ..	1	7	Exp.	1849.	Codsall Co. .. ..	..	1	F.R.
Mar 10	Alleston Bywater Co.	1	..	Exp.		Willen Hall .. ..	1	..	F.R.
	Middle Patricroft Co.	12	2	Exp.		Wolverhampton ..	..	1	F.R.
	Haydon Hill Co. ..	1	..	Exp.		Mostyn Co. .. ..	1	2	Exp.
17	Ditto .. ..	..	1	F.R.		Cwmavon .. ..	1	..	F.R.
	Badeley End Co. ..	2	2	F.S.		Dowlais .. ..	1	..	Exp.
	Woodthorpe Co. ..	1	..	F.R.		Aberywarr .. ..	1	..	F.R.
	Tonmaur Colliery ..	..	1	Exp.	May 5	Pondlebury Colliery	1	6	Exp.
	Bearmoor Colliery ..	..	2	F.R.		Fishpond's Colliery..	1	2	Exp.
	Lion Colliery .. ..	..	1	F.R.		Kingswinford .. ..	1	..	F.S.
	Consall Colliery ..	..	1	Exp.		Ditto .. ..	1	..	Exp.
	Wolverhampton ..	..	1	Exp.		Sandhill Colliery ..	1	..	F.R.
	Chillington Works ..	..	1	Ac.		Bilston .. ..	1	..	F.R.
	Strangeway's Co. ..	..	1	Exp.		Lestersfield .. ..	1	..	F.S.
	Meifield Co. .. ..	1	..	F.R.		Pennydaren .. ..	1	..	F.R.
	Whitwood Co. .. ..	1	..	F.S.		Butterworth .. ..	1	..	F.R.
24	Clydach Iron Works	1	2	F.R.		Cwmllranc .. ..	2	..	F.R.
	Cleator Iron Works..	1	..	Ma.		Still House Colliery..	1	..	Ma.
	Cyfartha .. ..	1	..	F.R.	12	South Roskear .. ..	..	1	F.S.
	Dowlais .. ..	..	1	Exp.		Dudley .. ..	..	1	Ac.
	Spital Tongues ..	1	..	F.R.		West Bromwich ..	2	..	Ac.
	Ronyhills .. ..	..	1	F.R.		Bilston .. ..	1	..	Ma.
	Clatterao Co. .. ..	..	1	F.S.		Tipton .. ..	1	..	Ma.
	Heath Co. .. ..	1	..	F.S.		Oldbury .. ..	1	1	F.R.
	Dowlais .. ..	1	..	F.R.		Maerty .. ..	1	..	F.R.
31	Hebburn Co. ....	2	..	F.S.		Wigan .. ..	..	2	Exp.
	Cleveland .. ..	1	..	F.R.		Little Lumley .. ..	1	..	Ac.
	Conygreaves Co. ..	2	..	F.R.		Risca .. ..	1	..	F.R.
	Kingshull .. ..	1	..	F.R.		Cwm Daws .. ..	1	..	Ma.
	Ulverston .. ..	1	..	Ac.	19	Merthyr .. ..	1	..	F.R.
	Kettley Iron Works..	..	7	F.S.		Plymouth Level ..	1	..	F.R.
April 7	Mosbro .. ..	1	..	Exp.		Dowlais .. ..	..	1	Ma.
	North Roskear .. ..	..	2	Exp.		Pen-y-daren .. ..	1	..	F.R.
	Bilston .. ..	1	..	F.S.		Gerdered Road ..	1	..	F.R.
	Tredegar .. ..	1	..	F.R.		Lynvi I. C. .. ..	..	2	F.R.
	Penpale Works ..	3	3	Exp.		Millfield .. ..	1	..	Ac.
	Risca .. ..	1	..	Exp.		Bell Farm Colliery ..	..	1	F.R.
	Darlston .. ..	1	..	F.R.		Woodshuts Colliery..	1	..	F.R.
	Cut Hedge .. ..	..	2	F.R.		Broomside Colliery ..	1	..	F.R.
	Holly Hole Mine ..	1	1	F.R.	26	Werfa Colliery .. ..	2	..	Exp.
	Hindley Green ..	1	3	Exp.		Free Forest Colliery	9	10	F.S.
	Higginthorn Co. ..	..	1	F.R.		Tipton .. ..	1	1	Exp.
	Congreaves Co. ..	..	1	F.R.		Kingswinford .. ..	1	..	F.R.
	Badyers Co. .. ..	..	1	Exp.		Dudley .. ..	1	..	F.R.
	Codsall Pit .. ..	..	1	2	F.R.	Botallack Mine ..	..	2	F.S.
	Titford Co. .. ..	1	..	F.R.		Boswiddin .. ..	1	..	F.R.
14	Great Polgooth ..	1	..	F.S.	June 2	Kingswinford .. ..	..	1	F.R.
	Pontypool .. ..	..	1	F.R.		Stratford-on-Avon ..	..	1	F.S.
	Aheryschan .. ..	1	7	Exp.		Caponfield .. ..	..	1	Ma.
	Bilston .. ..	1	..	F.S.		Bilston .. ..	..	3	Exp.
	Rowley Regis .. ..	1	..	F.R.		Bell Farm Colliery ..	..	1	F.R.
	Landshipping Co. ..	2	..	F.R.		Dudley Port .. ..	..	1	Exp.
21	Blaenarvon .. ..	1	2	F.R.		New Lion Colliery ..	..	1	F.R.
	Kingswinford .. ..	3	2	Exp.		Merthyr .. ..	1	..	F.R.
	Bilston .. ..	1	..	F.R.		Rochdale .. ..	1	..	Ma.
	Carn Brea .. ..	..	4	Ma.	9	Hebburn Colliery ..	32	1	Exp.
	Bearn Mine .. ..	1	..	Ma.		West Bromwich ..	1	3	F.R.
	West Bromwich ..	..	1	Ma.		Kinggoodie Quarry..	1	..	F.S.
28	High Pitington ..	1	..	F.R.		Farnworth .. ..	1	..	F.S.
	Hayden Hill Co. ..	1	..	F.R.		Bilston .. ..	3	..	F.S.
	Buck House Co. ..	..	1	F.R.		Dudley Port .. ..	1	..	Ac.

Date.	Name of Mine.	Killed.	Injured.	Cause.	Date.	Name of Mine.	Killed.	Injured.	Cause.
1849.	Dowlais .. ..	1 ..	F.R.		1849.	Bilston .. ..	1 ..	F.S.	
	Little Leva .. ..	1 ..	F.R.			Wolverhampton ..	1 ..	Ac.	
	Wheal Rore .. ..	1 ..	F.R.			Pennydaren .. ..	1 ..	F.S.	
	Witton Park Colliery	1 ..	Ac.			Merthyr .. ..	1 ..	F.R.	
	Brierly Hill .. ..	1 ..	Ac.			Thorpehall .. ..	2 ..	Exp.	
Jun. 16	N. Elswick Colliery ..	2 ..	Exp.			Thornley Pit .. ..	1 ..	F.S.	
	New Lion Colliery ..	1 ..	F.R.			Trimdon Colliery ..	1 ..	F.R.	
	Shuttend .. ..	1 ..	Exp.		Aug. 4	Aberamon .. ..	2 ..	Exp.	
	Wolverhampton ..	1 ..	F.R.			Dowlais .. ..	1 ..	F.R.	
	East Wheal Rore ..	1 ..	F.S.			Hadenshill Colliery ..	1 ..	F.R.	
	Delabole Slate Quarry	1 ..	Ac.			Greenhead Colliery ..	1 ..	Ma.	
	Bishopswearmouth ..	1 ..	Ma.			Horton Colliery ..	1 ..	Ac.	
	Gwennapp .. ..	1 ..	F.S.			Threapthwaite Co. ..	1 ..	Exp.	
23	Merthyr .. ..	1 ..	Ac.			Codnor Park .. ..	1 ..	F.R.	
	Cyfartha .. ..	1 ..	F.R.			Brierly Hill .. ..	1 ..	F.S.	
	Little Unsworth ..	1 ..	F.R.			Bilston .. ..	1 ..	F.S.	
	Gosforth .. ..	2 ..	4 Exp.			Darlaston .. ..	1 ..	Ma.	
	Dudley .. ..	1 ..	F.R.		11	Droyleston .. ..	1 ..	Exp.	
30	Laffack Colliery ..	8 ..	19 Exp.			Stow Heath Colliery ..	1 ..	F.S.	
	Morris Colliery ..	25 ..	43 Exp.			East Wood Colliery ..	1 ..	Exp.	
	West Bromwich ..	1 ..	Exp.			Evers Colliery ..	1 ..	F.R.	
	Buxton .. ..	1 ..	1 F.R.			Pontypool .. ..	5 ..	Exp.	
	Ayrshire Iron Comp.	3 ..	1 F.R.		18	Tividale .. ..	1 ..	F.S.	
	Amble .. ..	1 ..	F.R.			Crowan .. ..	1 ..	F.R.	
	Llaniallach .. ..	1 ..	F.S.			Bilston .. ..	1 ..	F.S.	
	Merthyr .. ..	1 ..	Ac.			Wolverhampton ..	1 ..	F.R.	
	Cyfartha .. ..	1 ..	Exp.			Wednesfield Heath ..	1 ..	Exp.	
	Tividale .. ..	1 ..	F.R.			Dixon's Green .. ..	1 ..	F.R.	
	Dunstone .. ..	1 ..	F.S.			Camborne .. ..	1 ..	F.R.	
	Summercoat .. ..	1 ..	F.R.		25	Haswell Pits .. ..	1 ..	Ac.	
	Derbyshire .. ..	1 ..	F.S.			Wishaw Colliery ..	8 ..	Exp.	
	Sedgely .. ..	1 ..	F.R.			Carmoyle .. ..	2 ..	F.S.	
July 7	Tarbach .. ..	1 ..	3 Exp.			Tipton .. ..	1 ..	F.R.	
	Ystalfera .. ..	2 ..	Exp.			Oldbury .. ..	1 ..	F.S.	
	Morfa Colliery ..	2 ..	2 Exp.			Thowset .. ..	1 ..	F.R.	
	Tividale .. ..	1 ..	Ac.		Sept. 1	Great Polgooth ..	1 ..	F.S.	
	Brierly Hill .. ..	4 ..	Exp.			Sedgeley .. ..	1 ..	F.R.	
	Rowley Regis .. ..	4 ..	Exp.			Kingswinford ..	1 ..	F.R.	
	Lanchester .. ..	1 ..	Ac.			Gainsborough ..	1 ..	Exp.	
	Wheal Lewis .. ..	1 ..	F.S.			Twydale .. ..	1 ..	F.R.	
	Wheal Margaret ..	1 ..	F.R.			Bates' Pits .. ..	1 ..	Ac.	
	Meadows Colliery ..	1 ..	F.R.		8	Llandavan Colliery ..	1 ..	6 Exp.	
14	Gateshead .. ..	1 ..	Exp.			South Roskear ..	1 ..	Ma.	
	Tipton .. ..	1 ..	F.S.			Pontypool .. ..	1 ..	F.R.	
	Brierly Hill .. ..	1 ..	F.R.		15	Tipton .. ..	4 ..	Exp.	
	Bilston .. ..	1 ..	1 Ac.			Brierly Hill .. ..	1 ..	Exp.	
	Dowlais .. ..	1 ..	F.R.			Dudley .. ..	1 ..	F.R.	
	Amble .. ..	1 ..	F.R.			Badgers Colliery ..	2 ..	Exp.	
	Gosforth .. ..	2 ..	Ac.			New Lion Colliery ..	1 ..	Exp.	
	Spring House Co. ..	1 ..	F.R.			Eagle Colliery ..	1 ..	F.R.	
	Kingswinford ..	1 ..	F.R.			Sedgely .. ..	1 ..	F.R.	
	Trentham Colliery ..	1 ..	F.R.			Tonge Moor .. ..	2 ..	F.S.	
	Oldham .. ..	1 ..	F.R.			Newbiggen Iron Wks.	1 ..	7 Exp.	
21	Newton .. ..	1 ..	1 Exp.			Pennydaren .. ..	2 ..	F.R.	
	Scots Green .. ..	1 ..	Ac.			Radcliffe Colliery ..	1 ..	F.R.	
	Whitehaven Colliery	1 ..	F.S.			Pennymarin Colliery	2 ..	F.S.	
	Minerva Colliery ..	9 ..	1 Exp.			Derwent .. ..	2 ..	Ac.	
	Clay Cross .. ..	1 ..	Exp.		22	Balswidden .. ..	1 ..	Ac.	
	Worsley .. ..	1 ..	Exp.			Great Polgooth ..	2 ..	F.R.	
28	Flint .. ..	8 ..	F.S.			South Wingate Co. ..	1 ..	F.R.	
	Wordsley .. ..	1 ..	Exp.		29	Cumnock .. ..	2 ..	Exp.	

Date.	Name of Mine.	Killed.	Injured.	Cause.	Date.	Name of Mine.	Killed.	Injured.	Cause.
1849.	Shuttend Colliery ..	2	1	Exp.	1849.	Hill Top Colliery ..	1	..	F.S.
	Bilston ..	5	1	F.S.		Ashton-under-Lyne ..	1	..	F.S.
	Bunker's Hill ..	1	..	F.R.		Wheal Seton ..	1	..	Ac.
	Llanidloes ..	1	..	Ac.		Myny-ddnewydd ..	1	..	F.S.
	Wednesbury ..	1	..	Ac.		Giet's Green ..	1	4	Ma.
	Wolstanton ..	1	..	F.S.		Rowley Regis ..	1	5	Exp.
Oct. 6	Burnley ..	3	2	Ma.		Pontypool ..	1	..	Ac.
	Wigan ..	..	2	Exp.		Hetherly Pit ..	1	..	F.S.
13	Wolverhampton ..	1	..	Ma.		Black Purse Colliery ..	1	..	F.R.
	Bilston ..	..	3	F.R.	Nov 24	Clay Cross ..	1	1	Exp.
	Sparrow's Colliery ..	1	..	F.R.		Shipley ..	1	..	Ac.
	Birmingham ..	1	..	Exp.		Ystalyfera ..	..	1	Exp.
	Tividale ..	..	1	F.S.		Brynder Colliery ..	1	..	Ac.
	Cradley ..	1	2	Exp.		Bilston ..	1	..	Ac.
	Shipley ..	1	..	F.R.		Bryndewy Colliery ..	..	2	Exp.
	Ystalyfera ..	..	1	Ac.		Woodridge Colliery ..	4	..	F.R.
	Walker Iron Works ..	..	3	Ma.		Walsall ..	1	..	F.S.
20	St. Austell ..	3	1	Ac.	Dec. 1	Dawley ..	1	4	Exp.
	Camborne Vean ..	..	1	Exp.		Neltherton Colliery ..	1	..	F.S.
	Pontypool ..	1	..	F.R.		Woodside Colliery ..	4	..	F.R.
	Vartey Iron Works ..	1	..	F.R.		Eskyr Co., Neath ..	..	20	Exp.
	Wakefield ..	1	..	F.S.	8	Wednesbury ..	1	..	F.R.
	West Bromwich ..	1	2	F.S.		Blackburn ..	1	..	F.R.
	Masboro Commons ..	..	1	F.R.		Cosely ..	..	1	F.R.
	Castle Mill Quarry ..	..	1	Exp.		Dudley ..	1	..	F.R.
	Brierly Hill ..	1	1	F.R.		Wigan ..	..	1	Ac.
	N. B. I. C. Works ..	1	..	Ma.		Woodhouses ..	1	..	F.S.
	Ashton ..	..	1	F.R.		Ditto ..	..	3	Exp.
	Tipton ..	..	1	Ac.	15	Rotheram ..	..	1	F.S.
27	Delahole Quarry ..	1	..	F.R.		Brynbo Colliery ..	2	1	Exp.
	Par Consols ..	1	..	F.R.		North Wood ..	2	..	Exp.
	Castle Mill Quarry ..	1	..	F.R.		Merthyr ..	2	..	F.R.
	Bitchburn ..	1	..	Ac.		Ditto ..	2	..	Ac.
	Daralston ..	1	..	F.R.		Heatherly ..	1	..	Ac.
	Aberdeen ..	..	1	F.R.		Sheffield ..	1	..	F.R.
	Shrubbery Iron Wks. ..	..	2	Ma.		Dean Colliery ..	1	..	Exp.
	Haydon's Colliery ..	..	1	F.R.		Cradley Heath ..	1	..	F.R.
	Weigfach Colliery ..	1	2	Exp.		Oak Farm Colliery ..	1	..	F.R.
Nov. 3	Cuddra Mine ..	3	..	Ac.		Shuttend ..	1	..	F.R.
	New Quay Consols ..	..	1	Ac.		Cystanog ..	1	..	F.R.
	Llanrjog ..	..	3	Ma.		Llanelly ..	..	3	Exp.
	Chapple Hill Colliery ..	..	1	Ma.		Wednesbury ..	3	..	F.S.
	Bilston ..	2	..	F.R.	22	Bolton ..	1	..	F.R.
10	Wheal Leta ..	1	..	Ac.		Dudley ..	1	..	F.R.
	Garras ..	1	..	F.R.		Rotheram ..	..	1	Ac.
	Dalmellington ..	2	..	Ac.		Wolverhampton ..	1	..	F.S.
	Merthyr ..	1	..	Ac.		Agecroft ..	1	..	F.R.
	Dyffryn ..	1	..	Ac.		Codnor Park ..	1	..	F.S.
	Dingdong Mine ..	..	1	Ma.		Lewis Mines ..	1	..	F.S.
	Dudley ..	1	..	F.R.		Rhymney ..	1	..	F.R.
	Parkfield Colliery ..	1	..	F.R.	29	Durham ..	1	..	F.S.
	Aberavon ..	1	..	Exp.		Horton ..	1	..	F.S.
17	Bucketsfield Colliery ..	1	..	F.R.		Murton Colliery ..	1	..	Ac.
	Meadows Pit ..	1	..	F.R.		Pelsall ..	1	..	F.R.
	S. Helton Colliery ..	1	..	Ac.		Bilston ..	1	..	F.S.
	Bennet's Colliery ..	1	..	F.R.		Lewis Mines ..	1	..	F.S.

We propose to give these returns annually, and we shall feel

gratified if our strenuous endeavours to draw attention to this crying evil may excite such notice that the ills so justly complained of may be effectually and speedily remedied.

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\* \* The sad loss of life incurred in the present year, since the compilation of these tables, adduces strong evidence in favour of the justice of our remarks.

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## AN INTRODUCTION TO MINERALOGY.

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THERE are many and great difficulties which arise when contemplating a new scientific classification of substances, as there are so many characteristics which must be taken into consideration in order to arrive at some certain order ; and at the same time all cannot be made use of in naming them, without bringing the whole into very great confusion. If we take a view of the system of mineralogy already adopted, we find that they have been classified differently, but without actual change of name, though in some instances one name is substituted for another. The present mineralogical nomenclature is of mixed origin ; some deriving their appellations from scientific persons, who first recognized them as separate substances ; some from the place where they first discovered ; some are of Greek or Latin origin ; and the remainder are named according to their chemical nature, as carbonate of lime, &c. &c. Thus we see a diversity of nomenclature entering into one mineralogical arrangement, the names for the most part conveying no idea of the substance to which they relate, but either derived from Latin or Greek, or from the original place where a mineral was first found (but now to be found in numerous other places), or from a noted mineralogist, serving not to denote the mineral, but to hand his name down from one generation to another ; and some are upon firmer grounds, as those founded upon chemistry. This last is the most perfect principle, and conveys an idea of a mineral, in itself very distinct, and certainly of great use. Though it would be almost impossible to name every mineral, on account of the number which bear a chemical affinity to each other, they are reduced under a certain number of heads, to which are added the class of minerals which they comprehend. There are only three classes ; viz.—I. Earthy minerals, divided into nine sub-species, from the



nine different elementary earths, which are among the chemical elements. However these have been reduced to metallic bases.

II. Native metals. III. Inflammable materials.

## CLASS I.

## EARTHY MINERALS.

New System.		Old System.
1. ZIRCONITE	.. ..	.. Zircon.
Do.	.. Ferro-zirconite	.. Hyacinth.
2. GLUCINITE	.. ..	.. Emerald, euclase.
Do.	.. Alumino-glucinite	.. Beryl.
3. SILICITE	.. ..	.. Quartz.
Do.	.. Hydro-silicite	.. Cat's-eye, opal, flint, menilite.
Do.	.. Alumino-silicite	.. Chalcedony, cornelian, onyx, agate, jasper, hornstone.
Do.	.. Calc-silicite	.. Zeolite, chabasite, stilbite, silicious sinter.
Do.	.. Ferro-silicite	.. Lievrite, garnet, cinnamon-stone.
Do.	.. Calcalumino-silicite	.. Idocrase, prehnite, heulandite, scolezite, Wernerite zoisite, epidote
Do.	.. Ferro-calc-silicite	.. Axinite, Indianite, lapis lazuli.
Do.	.. Ferro-alumino-silicite	.. Tourmaline.
Do.	.. Hydr. alumino-silicite	.. Slate, clay, fahlunite.
Do.	.. Baryti-silicite	.. Harmatome.
Do.	.. Magnesi-calc-silicite	.. Augite, sahlite, fassaite, euchysiderite, hornblende, pargasite, hedenbergite.
Do.	.. Magnesi-silicite	.. Tremolite, schiller spar, asbestos, kyanite, staurolite.
Do.	.. Potassi-silicite	.. Jade, obsidian, gabronite, petalite.
4. MAGNESITE	.. ..	.. Magnesia.
Do.	.. Hydro-magnesite	.. Hydrate of magnesia.
Do.	.. Alumino-magnesite	.. Pleonaste, iolite.
Do.	.. Silico-magnesite	.. Chrysolite.
Do.	.. Ferro-magnesite	.. Olivine, condrodite.
Do.	.. Calc-silico-magnesite	.. Serpentine.
Do.	.. Hydro-silico-magnesite	.. Steatite, chlorite.
5. YTTRITE	.. ..	.. Gadolinite.
6. ALUMINITE	.. ..	.. Aluminite.
Do.	.. Fluor-aluminite	.. Topaz, kollyrite.
Do.	.. Potassi-silico-aluminite	.. Mica.
Do.	.. Potass-aluminite	.. Lepidolite, nacrite.
Do.	.. Hydro-potass-aluminite	.. Haüyne, felspar, scapolite.
Do.	.. Calc-silica-aluminite	.. Meionite, sommitite, talc.
Do.	.. Ferro-potass-aluminite	.. Schorl, killinite, mellinite, rubellane.
Do.	.. Potassi-calc-aluminite	.. Clinkstone, pitchstone, lava, basalt, pumice.
Do.	.. Hydr.-aluminite	.. Wavellite.

	New System.	Old System.
7. CALCITE	.. ..	.. Chalk.
Do.	.. Carboni-calcite	.. Carbonate of lime.
Do.	.. Stronti-calcite	.. Arragonite.
Do.	.. Magnesi-calcite	.. Bitter spar, pearl spar, brown spar, dolomite.
Do.	.. Phosphori-calcite	.. Apatite.
Do.	.. Fluori-calcite	.. Fluor.
Do.	.. Sulphuri-calcite	.. Anhydrite, vulpinite, gypsum.
Do.	.. Nitro-calcite	.. Nitrate of lime, dathalite.
Do.	.. Bara-magnesi-calcite	.. Boracite.
8. BARYTE	.. ..	.. Barytes.
Do.	.. Carboni-baryte	.. Witherite.
Do.	.. Sulphuri-baryte	.. Heavy spar.
9. STRONTITE	.. ..	.. Strontia.
Do.	.. Carboni-strontite	.. Strontianite.
Do.	.. Sulphuri-strontite	.. Celestine.

## MINERALS PRINCIPALLY ACIDIFEROUS.

10.	..	.. Alumino-potassite	.. Alum.
	Do.	.. Nitra-potassite	.. Nitre.
	Do.	.. Carbo-sadalite	.. Natron.
	Do.	.. Boro-sadalite	.. Borax.
	Do.	.. Murio-sadalite	.. Salt.

## CLASS II.

## NATIVE METALS.

1. PLATINA	.. ..	.. Platina.
2. PALLADIUM	.. ..	.. Palladium.
3. IRIIDIUM	.. ..	.. Iridium.
4. OSMIUM	.. ..	.. Alloy of iridium and osmium.
5. GOLD	.. ..	.. Gold.
6. SILVER	.. ..	.. Silver.
Do.	.. Antimonial silver	.. Antimonial silver.
Do.	.. Molybdic silver	.. Molybdic silver.
Do.	.. Sulphuret of silver	.. Sulphuret of silver.
Do.	.. Bismuthic silver	.. Bismuthic silver.
Do.	.. Carbonate of silver	.. Carbonate of silver.
Do.	.. Muriate of silver	.. Muriate of silver.
7. MERCURY	.. ..	.. Mercury.
Do.	.. Sulphuret of mercury	.. Cinnabar.
8. COPPER	.. Ferrate of copper	.. Grey copper.
Do.	.. Sulphuret of copper	.. Copper pyrites.
Do.	.. Oxide of copper	.. Red oxide of copper.
Do.	.. Carbonate of copper	.. Carbonate of copper, chryso-cola.
Do.	.. Sulphate of copper	.. Blue vitriol.
Do.	.. Phosphate of copper	.. Phosphate of copper.
Do.	.. Arseniate of copper	.. Arseniate of copper.
9. IRON	.. Sulphuret of iron	.. Iron pyrites.
Do.	.. Aluminate of iron	.. White iron pyrites.
Do.	.. Magnetic sulpht. of iron	.. Magnetic iron.
Do.	.. Oxide of iron	.. Oxide of iron.
Do.	.. Oligistic iron	.. Specular iron.

## New System.

## Old System.

9. IRON	..	Hydrate of iron	..	Red iron ore.
Do.	..	Hydro-silicate of iron	..	Brown iron ore.
Do.	..	Silicate of iron	..	Jaspery iron ore.
Do.	..	Carbonate of iron	..	Spathose iron.
Do.	..	Phosphate of iron	..	Blue iron ore.
Do.	..	Sulphate of iron	..	Green vitriol.
Do.	..	Chromate of iron	..	Chromate of iron.
Do.	..	Arseniate of iron	..	Arseniate of iron.
Do.	..	Oxalate of iron	..	Oxalate of iron.
10. MANGANESE	..	..	..	Manganese.
Do.	..	Silicate of manganese	..	Siliferous oxide.
Do.	..	Oxide of manganese	..	Oxide of manganese.
Do.	..	Sulphuret of manganese	..	Sulphuret of manganese.
Do.	..	Carbonate of manganese	..	Carbonate of manganese.
11. ARSENIC	..	..	..	Arsenic.
Do.	..	Sulphuret of arsenic	..	Realgar.
Do.	..	Oxide of arsenic	..	Arsenic bloom.
12. BISMUTH	..	..	..	Bismuth.
Do.	..	Sulphuret of bismuth	..	Sulphuret of bismuth.
Do.	..	Carbonate of bismuth	..	Carbonate of bismuth.
13. ANTIMONY	..	..	..	Antimony.
Do.	..	Sulphuret of antimony	..	Grey antimony.
Do.	..	Oxide of antimony	..	Red antimony.
14. MOLYBDENA	..	..	..	Molybdena.
Do.	..	Sulphuret of molybdena	..	Sulphuret of molybdena.
Do.	..	Oxide of molybdena	..	Oxide of molybdena.
15. TELLURIUM	..	..	..	Tellurium.
16. TIN	..	..	..	Tin.
Do.	..	Oxide of tin	..	Oxide of tin.
Do.	..	Sulphuret of tin	..	Sulphuret of tin.
17. TUNGSTEN	..	..	..	Tungsten.
18. TITANIUM	..	..	..	Titanium.
19. SPHENE	..	..	..	Sphene.
20. CERIUM	..	..	..	Cerium.
21. URANIUM	..	..	..	Uranium.
22. COLUMBIUM	..	..	..	Columbium.
23. CHROME	..	..	..	Chrome.
24. COBALT	..	..	..	Cobalt.
Do.	..	Sulphuret of cobalt	..	Sulphuret of cobalt.
Do.	..	Arseniate of cobalt	..	Bright white cobalt.
Do.	..	Oxide of cobalt	..	Cobalt bloom.
Do.	..	Sulphate of cobalt	..	Red vitriol.
25. NICKEL	..	..	..	Nickel.
26. LEAD	..	..	..	Lead.
Do.	..	Sulphuret of lead	..	Galena.
Do.	..	Carbonate of lead	..	Carbonate of lead.
Do.	..	Muriate of lead	..	Muriate of lead.
Do.	..	Phosphate of lead	..	Phosphate of lead.
Do.	..	Arseniate of lead	..	Arseniate of lead.
Do.	..	Sulphate of lead	..	Sulphate of lead.
Do.	..	Molybdate of lead	..	Molybdate of lead.
27. ZINC	..	..	..	Zinc.
Do.	..	Sulphuret of zinc	..	Blende.
Do.	..	Red oxide of zinc	..	Red oxide of zinc.
Do.	..	Carbonate of zinc	..	Carbonate of zinc.

## CLASS III.

## INFLAMMABLE MATERIALS.

New System.				Old System.
DIAMOND..	..	..	..	.. Diamond.
SULPHUR	..	..	..	.. Sulphur.
COAL ..	..	..	..	.. Bovey coal.
Do.	..	Bovey coal	..	.. Bovey coal.
AMBER ..	..	..	..	..

Here we have, then, comprised under three heads, the products of the mineral kingdom—the chemical name either denoting one or a class of several minerals, as stated.

Let us now look at the peculiarities of minerals, and the reference they have with other sciences. It may, perhaps, be at first rather disheartening to the student of mineralogy if he be told that several sciences are the natural accompaniments of this one, though the knowledge of all is not necessary in all cases. The thorough practical mineralogist alone requires them all, so as to be able to turn them to account in ascertaining a mineral body; on the contrary, a person wishing only to be able to distinguish one from another, may be content with the outward signs, or physical mineralogy, as I term it.

The three sciences of mineralogy, chemistry, and physics, are so connected together that the one naturally leads to the other. Suppose we have a mineral unknown to us, which we wish to find out, agreeing in physical character with many other varieties, the first mode of distinction resorted to for analysis is chemistry, as the most certain method of distinguishing them. Should crystallography be your particular branch, you cannot proceed well without a knowledge of mathematics, and more particularly of geometry. Again, if we view the connection this science has with geology—two sciences, although entirely different, very intimately connected, as being branches of one and the same, we find we are led on to contemplate natural history, in the form of fossil osteology, fossil botany, and fossil conchology—all of which sciences have a reference to physics. The great revolutions which have taken place on the surface of our earth have been the effects of mechanical compression in some instances, and of a general eruption, caused likewise by the physical agency, in others.

Minerals have general characteristics by which they may be distinguished from one another. These characters are—solidity, liquiform or æriform, colour, taste, smell, appearance, porosity, opacity, lustre, and tenacity. Most minerals are sold in their native state, though they change appearances, perhaps, when exposed to heat; and a few occur liquid, as mercury, which on exposure to heat assumes the æriform state. The colour of



minerals is a very prominent distinguishing mark, by which in many cases the species of a mineral may be made out, and the diversity of shades of one colour makes it in some cases a matter of no little difficulty to be able to do so. There is scarcely a colour which is not to be found in the mineral kingdom, and many, of great use, are found in it only. Another distinguishing mark is taste, though it is rarely resorted to. Clayey minerals have a very peculiar taste, as also some metals, as arsenic and iron. The smell is not always to be detected, though in most cases a clayey substance can be told by the smell which it gives out when breathed on. By appearance the species of a mineral is detected, as, for instance, whether it is mammillated, compact, crystallized, earthy, or so on. When accustomed to the sight of minerals, it is by appearance almost entirely that you determine a mineral, though it would be impossible to do so at first; but the eye becomes gradually accustomed to its form, colour, and general characteristics, till at length it is enabled to determine with almost unerring certainty not only the mineral itself, but also the variety to which it belongs. Very few minerals are porous to the eye (that is, penetrated by holes), though numbers are invisibly perforated by very minute openings between the pieces. Pumice is visibly porous, and absorbs water easily. Some minerals are opaque, that is, they do not permit the rays of light to pass through them; whilst others, as quartz, are in some cases so transparent, that objects may be distinctly seen through them—this we denominate transparency; or, when the contrary takes place, opacity.

**ZIRCONITE** (*zircon*, Phillips; *jargon*, Romé de Lisle; *zirkon*, Werner).—This class of minerals is divided into three orders: the zircon, jargoon, and hyacinth, all of which differ but little in their composition; their external colour is also much alike, varying from red to grey, and rarely green or white, and they all occur crystallized. The primitive form is an obtuse octahedron, and it occurs principally in the form of a rectangular four-sided prism, truncated on the lateral edges. It possesses the property of double refraction in some degree, specific gravity 4.557. Before the blowpipe this class of minerals is infusible, and the analysis of Klaproth determines its composition to be zirconia 69, silica 26.50, and oxide of iron 0.50. In the hyacinth the iron is much more abundant, being on an average about two per cent. It occurs in Auvergne, near Enpailly, in a volcanic sand; in Spain, Silesia, Italy, and Bohemia; and it occurs in sienite in Norway. It is also found in Ceylon, Siberia, and Java, and is of frequent occurrence in the primitive rocks of North America. The zirconite of Phillips occurs in the same form, though sometimes the chemical composition varies by the addition of a small quantity of titanium. The colour of all the classes of zirconite can be destroyed by heat.

GLUCINITE (*emerald*, Phillips ; *smaragd*, Werner). — This class, which includes those minerals commonly known by the name of emerald, euclase, and beryll, derives its name from the chemical element *glucina*, which is contained in all the varieties (and in this class only); whence its rarity. The colour of all the varieties is a green, of different degrees of intensity, sometimes passing into bluish-green, and more transparent according to the size, the smaller varieties being almost entirely opaque. They all occur crystallized in small six-sided prisms, and the varieties are produced by the terminal angles being replaced by planes, or by the solid angles by triangular planes. The variety known by the name of *euclase* is exceedingly frangible. The constituent parts of the emerald are—silica, 64·5 ; alumina, 16 ; glucina, 13 ; oxide of chrome, 3·25 ; lime, 1·6 ; and water, 2 ; and its colour is believed to be owing to the presence of chrome. It is found principally in Peru ; it also occurs in Salzburg, and in Ethiopia. It is principally met with in primitive rocks, more particularly mica-slate, though sometimes in the sand of rivers. Its colour causes it to be much used in jewellery, though the pure transparent varieties are scarce. The beryll (aluminoglucinite) is hardly distinguishable from the emerald, on account of its strong resemblance in outward appearance. The crystals of the beryll are longer than those of the emerald, and the proportion of glucina is smaller in this variety than in the former. The specific gravity of this class is from 2·650 (Werner) to 2·722 (Brisson), and the varieties are all with difficulty fusible before the blowpipe.

SILICITE (*quartz*, Phill., Jamieson ; *quartz*, Werner).—It comprehends a great variety of minerals, differing only in their colour and outward appearance, their composition, with the exception of a foreign metal, to which the different varieties owe their colours, being the same. They occur both massive and crystallized ; the regular form is a six-sided prism acutely terminated, generally in groups, and rarely single. When two pieces of quartz are rubbed together, they become phosphorescent, which property is very visible at times. Silicite, as its name denotes, consists almost entirely of silex, this earthy element being in the proportion of 99, with 1 per cent. of water of crystallization. The white quartz occurs in almost every country—in primitive rocks, with various metals and earths, and sometimes beautifully aggregated. In England the finest specimens are from Cornwall ; in France from Dauphiné and Auvergne ; and also in the Alps, Bohemia, Saxony, and Sweden ; and in the New World and the remaining continents it is equally abundant.

*Purple quartz, or amethyst*, is a variety in which alumina enters into the composition, though in a very small proportion, and in some specimens a trace of manganese has been detected (*vide*

Rose Karsten's Tabell, s. 23). It is found in Scotland and Ireland, in Sweden, Saxony, Spain, France, and Hungary, both massive and crystallized, and also near Guanaxuato, in Mexico. Its colour is a bright purple or violet, bordering on pearl grey.

*Rose quartz* is distinguished again by its colour, which is supposed to be produced by manganese, and, like the preceding variety, occurs both massive and crystallized. It is found in Bohemia, Bavaria, Spain, and France, and in Greenland and the United States in North America.

*Yellow quartz* has received the various appellations of Cairn-ghorm topaz and Bohemian topaz, on account of the resemblance it bears to that beautiful gem, and from its locality; and in addition to the above-mentioned places, it occurs in several of the mines in Cornwall.

*Ferruginous quartz* is the result of the admixture of a considerable portion of iron with the siliceous, which gives it a rusty brown opaque appearance, by which it is characterized. The German name *Eisenkiesel* (iron gravel), implies at once its composition; and the appearance of some of the specimens of this variety of quartz bears a strong resemblance to gravel, though the terminated six-sided prism is still preserved. It is found in Saxony, Bohemia, Spain, Altenburg, Siberia, and North America.

*Brown quartz* accompanies the yellow varieties in most of its localities, and is generally of a smoky brown colour, whence its French appellation—*Quartz hyalin enfumé*.

*Hyalite* is a variety of quartz which is found investing the cavities of rocks, somewhat similar to silicious sinter, though more transparent. It occurs in Tuscany, Silesia, Germany, near Frankfort, and Mexico.

*Arenaceous quartz, or sand*, is a variety of quartz of so common occurrence that I need hardly make any mention of it. It is conjectured to have originated from the destruction of quartz. Its colour, which is principally yellowish-white, passes into every shade of the various blue, green, black, red, and yellow tints.

**HYDRO-SILICITE** (includes *opal, hydrophane, menilite, flint*).—This is the second class in the silicious genus, and its composition varies from a small to a larger proportion of water with silica; for though the preceding class contains a small proportion of the same water of crystallization, the minerals in that class cannot be reckoned under this head. The *hyalite* is the only one which approaches this chemical composition, the average of water being about 6 per cent. The *cat's-eye*, the most precious of the class denominated opal, occurs in small grains, of a yellowish or brownish grey colour, and imbedded in sand or primitive rock. *Precious opal* is nearly allied to this mineral, and contains 19 per cent. of water, the only difference being the size



in which it occurs, and the additional splendour, on which account it has received the name of *fire opal*. It occurs in primitive rocks, very frequently lining cavities in those of plutonic origin, and though not abundant, it is met with in various places, more particularly in the Alps, in Bohemia, at Freyberg, and in North America. (Phillips has accounted precious opal and fire opal different varieties; *vide* Phillips, Min. p. 9.) *Common opal* is intermediate between this last variety and the *semi opal*, possessing the resinous appearance of the former, but approaching the latter in opacity. The colour is principally yellow, though it is found of various shades of grey, and it occurs more frequently than any variety of opal; the finest specimens, however, are from Cornwall. The *semi opal* is known by its decided opacity, and is in general striated, some parts being more transparent than others, though it is sometimes uniform in appearance. The very beautiful variety, known by the name of *wood opal*, occurs in Hungary, and is generally of a silky-white or yellowish-white colour, tinged in places by iron; it is much lighter than the preceding varieties, and is easily distinguishable by its fibrous, wood-like appearance.

*Hydrophane* is nearly allied to the foregoing class of minerals, both in general appearance and composition; the only difference is, that the proportion of water is smaller than in the preceding varieties, and consequently it is considered a variety of opal. It occurs in Bohemia, Saxony, and South America.

*Menilite* (*leber opal*, Reuss; *menilith*, Leonhard).—It is of a slaty texture, somewhat approaching the appearance of chalk, and nearly allied to semi opal. It contains 12 per cent. of water, and is found in the formation round Paris. *Flint* occurs of a variety of colours, generally, however, of shades of grey and black; it contains a smaller quantity of water, but little more than 3 to 4 per cent., and in some cases even less. It is found in the chalk formations in regular beds, and in nodules which frequently contain quartz crystals. The specific gravity of this class averages about 2.50, and the appearance is intermediate between silicite and *alumino-silicite*.

**ALUMINO-SILICITE** (*chalcedony*, *onyx*, *plasma*, *heliotrope*, *chrysoprase*, *cornelian*, *agate*, *jasper*, *hornstone*).—It forms a very important division of the silicious minerals, both on account of the number of specimens which are classed under it, and also on account of their splendour; for this reason they are much employed for ornamental purposes. The *common chalcedony* is nearly allied to flint in appearance when broken, though the botryoidal form in which it occurs at once distinguishes it from that mineral. It contains 16 per cent. of alumine, and 84 of silex. Its colour is grey for the most part, and semi-transparent or translucent. It occurs in almost every country of both hemispheres, and the finest specimens are from Siberia and



Hungary. *Onyx* is formed of layers of brown and white chalcedony, and is used in jewellery. In combination with *sard*, a mineral of the same class, but of a reddish-brown colour, it forms *sard-onyx*, an alternation of the sard with layers of white chalcedony. *Plasma* is a variety of chalcedony of a light-green colour, over the surface of which small red spots are visible. It is principally obtained in Moravia and Italy. The *heliotrope* is very similar to the foregoing species, the difference consisting in the colours being darker, and the red spots more positive; in some specimens, particularly in those from Bohemia, the red predominates. It is found also at various parts of Scotland and in Siberia, and is used in jewellery. *Chrysoprase* is of a fine green colour, generally uniform. Its principal ingredient is quartz (96 per cent.); and in addition it contains a small quantity of alumina and also lime. The finest specimens are from Greenland and Spain. The *cornelian*, another very useful gem, is of a beautiful red or white colour in some instances, sometimes uniform, at others beautifully marked in a circular form. It is of frequent occurrence, being found not only in different countries on the Continent, but also in considerable quantities on the coasts of Scotland and Wales. Being softer than common chalcedony, it is used for engraving, and it bears a very high polish. *Agate* is a compound mineral, composed of alternate layers of different varieties of chalcedony; for instance, the common chalcedony and cornelian with amethyst, white quartz, and hornstone, but the first-mentioned minerals predominate. The fortification agate derives its name from its appearance, as do the moss, and also the ribbon agates. The most beautiful varieties are from Oberstein, mostly occurring very large, and of which I have several very fine specimens. The *jasper* is a similar mineral, though the ingredients are not so numerous, siliceous still predominating, with a small quantity of iron and alumina. It is found in Cornwall and on most of our coasts, and in great quantities in Egypt, and was mentioned at very early times as being of great use for ornamental purposes. *Hornstone* has not been carefully analyzed, though in most cases where chemistry has lent its aid to the detection of its constituents, a portion of alumina has been found. It is found in Wales, Bohemia, France, and Sweden. *Wood-stone* is a variety of this mineral. The specific gravity of this class varies from 2.50 to 3.10, and the minerals included are all infusible without addition before the blowpipe. Proceeding according to the chemical arrangement, the next in order is the class **CALC SILICITE**, including the minerals known by the name zeolite and its varieties—*silicious sinter*. (*Vide* Jamieson, vol. i. p. 351, and other authorities.) This class is more numerous in elements, containing a large proportion of alumina, and in some cases potash in addition to the siliceous, though the lime is the

characteristic ingredient, whence it derives its name ; for though it occurs only in a small proportion, it is an ingredient in every variety in a greater or less degree. *Leuzite* is of a white or grey colour, occurring crystallized in igneous rocks, more particularly in the lavas of Vesuvius and Etna. *Analcime* contains 10 per cent. of natron in addition to the silex, alumina, and lime ; its colour is white, of various shades, seldom occurring massive, but generally in crystals, the primitive form of which is the cube. It is found in the island of Skye, in Scotland, in Perthshire, Bohemia, and in the Hartz. *Chabasite* approaches the foregoing variety in the proportion of its ingredients and general appearances. It occurs mostly crystallized, and the primitive form is the rhomboid. The localities are in the islands of Mull and Skye, at Oberstein, and in Greenland. *Cross-stone* derives its name from its form. In general it contains but little lime, though in varieties from Bilin in Bohemia, 2 per cent. have been detected on analysis with care, whereby it retains its place in the class which we are now examining. It accompanies the preceding varieties in all the localities in which they are found. *Laumonite* contains from 9 to 11 per cent. of lime, and is the accompanying mineral of all the other varieties. *Needle zeolite* is found in the cavities of the basaltic pillar of the Giant's Causeway and of Staffa, occurring massive and in distinct concretions (*mesotype*, or common fibrous zeolite, is another name for the massive needle zeolite). *Apophyllite* contains a very large proportion of lime, and, according to the analysis of Vauquelin, of a variety from Utoen, as much as  $28\frac{1}{2}$  per cent. It occurs most frequently massive, and not unfrequently crystallized, in Greenland, Bohemia, and Saxony. *Stilbite* is the radiated zeolite of Jamieson, and is nearly allied to apophyllite. *Silicious sinter* is the deposit of the silex contained in the water of the geysers, and is generally found stalactitic. Its specific gravity is little more than 1.5 ; it contains but little lime. The properties of this class are very decided, except in the last variety, with the exception of which, the average specific gravity is 2.30 ; they all occur in rocks of plutonic origin, and are all fusible with intumescence before the blowpipe.

**FERRO-SILICITE** contains *lievrite*, *garnet*, and *cinnamon-stone*.

**LIEVRITE** (*yenite*, Haüy).—It is of a brown or black colour, varying in intensity, and it occurs amorphous and crystallized. In composition it resembles garnet, with the exception of lime, which is the peculiarity of this mineral, whilst the proportion of iron is nearly the same as in the preceding class. This rare mineral has only been found in Corsica. Its name is derived from its discoverer, Le Lievre.

**GARNET** (*grenat*, Haüy ; *granat*, Leonh.) comprises a great variety, which differ very materially in some points from one another. The garnet of jewellery (*almandine*) is of a beautiful

reddish-brown colour, sometimes having a tendency to become yellow. It occurs principally in primitive rocks, crystallized in the form of a rhomboidal dodecahedron, and less frequently granular. The most beautiful varieties are from Pegu, and others, though sometimes larger, but not so brilliant, are from the Alps, Bohemia, Italy, Brazil, and Ceylon. The *common garnet* differs but little from the precious, both of them occurring (crystallized) in the form of a rhomboidal dodecahedron, though the common garnet is more frequently granular, but it is softer than almandine, and is not employed for ornamental purposes, on that account. It is a very abundant mineral, occurring principally in mica-slate, gneiss, and sometimes in granite. In the mountains of Styria they are met with upwards of two pounds in weight. (*Vide* Phillips's Mineralogy, p. 28.) The name *pyrope* has frequently been given to common garnet, but it differs, on account of the magnesia it contains. The following are varieties of garnet:—

*Pyreneite*.—Colour is greyish-black, and it occurs crystallized. Before the blowpipe it loses its colour. Locality is the Pic of Eres Lids, in the French Pyrenees.

*Grossulare*.—Its colour is grass-green, and it likewise occurs crystallized in the form of the dodecahedron. It melts before the blowpipe. Locality is near the river Wilni, in Siberia.

*Melanite*.—Its colour is greyish-black, or velvet-black, and it occurs in roundish grains, and also crystallized in the common form of the garnet. Locality is Frescati, near Rome, and Monte Somma, near Naples.

*Allachroite*.—Its colours are greenish-grey and yellowish-grey. It changes colour before the blowpipe. Locality, Vilus iron-mine, near Drammen, in Norway.

*Collophonite*.—Its colour is yellowish-brown. It occurs massive, and crystallized in rhomboidal dodecahedrons. It is found at Arendahl, in Norway, and Piedmont.

CINNAMON-STONE (*kanelstein*, Werner; *essonite*, Haüy).—Its colour is in general a bright red, passing into orange-yellow. It occurs massive, of a shining appearance. Specific gravity is 3.61. It occurs in Ceylon, in granite rock, and in alluvial deposits. The average specific gravity is 2.50, and the percentage of iron varies from 13 to 45 per cent.

CALCULUMINO-SILICITE (comprises *idocrase*, *prehnite*, *heulandite*, *Thomsonite*, *scolezite*, *Wernerite*, *epidote*, and *Indianite*).—The strong resemblance which exists in the chemical composition of the different minerals of this class, necessarily causes the physical mode of determination to be used to make a further distinction, and I shall therefore reserve the chemical description till I have completed the enumeration of the physical properties of each.

IDOCRASE (*Vesuvian*, Werner; *idocrase*, Haüy) is of yellowish



or greenish colour, sometimes occurring massive, though more frequently crystallized. It possesses the property of double refraction. This mineral occurs principally in volcanic districts, particularly in the regions near Vesuvius and Etna, and it is likewise found in the primitive districts of the Alps and Siberia.

**PREHNITE** (*prehnite*, Werner and Haüy ; *Prehn spath*, Mohs).—The origin of the name of this mineral may be attributed to the circumstance of its having been first brought from the Cape of Good Hope by Colonel Prehn. Its colour varies from yellowish to greenish white, and is slightly translucent. Among the situations in which this mineral is found, that of Oisans, in Dauphiné, is perhaps one of the most interesting, on account of the various minerals with which it is combined. It is likewise found in Bohemia and in the Alps. In America fine specimens are obtained in Greenland.

*Heulandite* derives its name from its discoverer. It consists of the same earths as the preceding variety, and its colour varies from red to brownish-grey, and it occurs in small quantities in Scotland and Dauphiné.

*Thomsonite* and *scolezite*.—Varieties of the same class of minerals, similar to the preceding kinds in every respect except colour. The Thomsonite is of a brownish-white hue, occurring radiated and fibrous; the scolezite in general very minutely crystallized or massive, and of a greenish-white colour. The localities of these minerals are nearly the same as those of the last-named.

*Wernerite* is a rare mineral, occurring of a greenish-grey colour, imbedded in primitive rocks, and very rarely crystallized. It occurs principally at Arendahl, in Norway, in Sweden, and Switzerland.

**EPIDOTE** (*pistacite*, W. ; *thallite*, Karsten) is found in a variety of forms, principally massive, though often crystallized and granular; the colours are also various, occurring green, yellow, blue, or black, and it belongs exclusively to the primitive groups of rocks. It is a mineral found in great quantities in districts of all the above-mentioned formations in this country, in France, Transylvania, and in Guernsey. The localities in America are likewise numerous.

*Zoisite*, like other minerals, derives its name from the person who first found it. The colours are shades of yellow and grey, and in composition it resembles all the varieties of this class. It is found in Carinthia, at Salzburg, and in the Tyrol. The general properties of this class are—a less degree of hardness than most of the minerals of the silicious class, melting before the blowpipe, and composition, on an average, 40 per cent. silex, 35 alumina, 20 lime, and iron or manganese the remainder.

*Indianite*.—This mineral is of rare occurrence; it is of a whitish or greyish colour, and of a shining lustre. It is trans-



lucent, and inferior but little in hardness to quartz. Bournon mentioned it as forming the gangue of Corundum, in the Carnatic. (*Vide Phillips*, p. 37.)

FERRO-CALC-SILICITE (includes *axinite*, *lapis lazuli*, and *dipyre*).

AXINITE (*Thumerstone*, J.; *axinit*, Leonh.).—The English name is derived from the form of the crystals, and Thumerstone is from its locality at Thum, in Saxony. It occurs crystallized, the primitive form being a right prism. Its colour is a fine brown, though some specimens, from containing a quantity of chlorite, are of an opaque green. It is by no means abundant, lining the cavities of primitive rocks in Saxony, in the Alps, in Norway, and in the Botallack mine, at Land's End, in Cornwall.

LAPIS LAZULI (*lazurstein*, Leonh.; *azure stone*, T.).—This mineral, from which the ultramarine is extracted, is of a fine azure-blue colour. It is principally found in the massive state, though mention has been made of crystallized lapis lazuli. It is found imbedded in primitive rocks, in which iron pyrites are disseminated. The finest specimens are from Persia.

DIPYRE (*schmelzstein*, Werner) is a mineral of great rarity, occurring of a reddish-white colour, and massive. It is found at Mauleon, in the western Pyrenees. It melts with intumescence before the blowpipe, and it contains but little iron.

FERRO-ALUMINO-SILICITE (includes *tourmaline*).—Like some of the varieties of silicites, the colours of this class of minerals vary considerably, on which account I have reserved the descriptions of them till I mention the different sorts. All the varieties occur in prisms striated longitudinally, mostly in the primitive formations. Some are transparent, some translucent (blue is transparent, green translucent, pink and black are opaque). Frequently it is found in six-sided prisms, which possess the property of electricity. Specific gravity is 3.

*Blue tourmaline*, of a transparent blue colour, occurring at Utoen in Sweden, and in the State of New York.

*Green tourmaline* is of a light grass-green colour, generally translucent, though often opaque; found at Ceylon and in Brazil. Very fine specimens are found in the primitive rocks of the Alps. The colour is the result of the admixture of manganese.

*Pink tourmaline* is of an opaque pink colour, occurring in long striated prisms in primitive rocks. Very fine specimens are obtained in Bohemia.

*Black tourmaline* is the commonest of the varieties of tourmaline. It occurs principally in quartz rock in large crystals, or in veins traversing the same rock. It is also found in small crystals in the granite of Heidelberg, and it is frequent in Cornwall, Scotland, and Ireland. All these minerals melt into a pale glass before the blowpipe.

**HYDR.-ALUMINO-SILICITE** (includes *clay*, *slate*, and *fahlunite*).—This is another large division of minerals. As a general mode of distinction, these never occur crystallized, and belong to the secondary group of rocks.

*Wacké* occurs massive, of a green, grey, or yellowish colour, and is somewhat greasy to the touch, yielding easily to the knife. It occurs in districts of volcanic origin.

*Common clay* occurs of a variety of colours, generally yellowish-grey, sometimes brownish-grey (London clay), of a soft appearance, and possessing when damp considerable tenacity, whilst some varieties when dry are exceedingly brittle. It is found in alluvial countries, on the banks of most rivers, and at the deltas of some few. Fossil remains, both of crustacea and plants, are frequent in the London clay. Above this formation rests the "loam," commonly known by the name of "brick earth." In appearance it is sandy, containing very few fossils.

*Plastic or potter's clay* derives its name from its tenacity. Its colour is generally greenish, and it is much employed in the fabrication of the common varieties of pottery. Teignmouth in Devonshire yields considerable quantities.

*Shale (slate clay, Phillips)* occurs above the coal in the carboniferous districts of this and other countries. It occurs massive, and generally of a greyish-green and blue colour. It is abundant in the production of fossil plants, among which are several varieties of ferns.

*Rotten-stone* is of a brownish-red colour, very soft, and contains, according to the analysis of R. Phillips, 86 of alumina, 4 of silex, and 10 of carbon. It is believed to originate from the decomposition of shale, and is found in Derbyshire.

*Tripoli* has been found of various colours, generally of shades of grey, yellow, or red. It is of a very argillaceous appearance, and yields easily to the knife. It was originally brought from Tripoli, in Africa, but is now found in the department of Puy de Dome, in Saxony, and in Russia.

*Polishing clay* is another name of this mineral.

*Lithomarg (steinmark, Werner; argile lithomarge, Haüy)* is of a yellowish or reddish colour, frequently occurring spotted. It is soft, and adheres to the tongue. It is found in the porphyritic districts of Baden, and in Saxony.

*Cimolite* is of a grey colour, and generally occurs massive. It is found in the island of Cimola.

*Bole* is of a brownish, blackish, or blackish-white colour. It adheres to the tongue, yields to the nail, and when immersed in water, breaks to pieces. It occurs at the Giant's Causeway, in France, and in Silesia.

*Mountain meal* is so light as to swim in water. It is a rare mineral, and has only been found at Santa Tiora in Tuscany.

*Pipe-clay* is of a yellowish-white colour, and is known by a

slight greasy feeling to the touch. It is found in the chalk district in the neighbourhood of Handfast Point, in Dorsetshire.

**BARYTE-SILICITE** (includes *harmatome*, *amianthoide*).

*Harmatome* is nearly allied to cross-stone, but contains in addition to the constituent earth of the latter mineral, a proportion of barytes, varying from 3 to 9 per cent. It accompanies most of the varieties of zeolite in the localities in which they are found. Its colour is yellowish or brownish-grey. It occurs rarely massive, more frequently however crystallized.

*Amianthoide* resembles asbestos, both in colour and appearance; like that mineral, its colour is greenish-grey, and it is also flexible. In a specimen from Oisans 6 per cent. of barytes has been detected.

**MAGNESI-CALC-SILICITE** (includes *augite*, *sahlite*, *fassaite*, *hornblende*, *pargasite*, *hedenbergite*, and *carinthin*).

*Augite* is found generally in crystals, and forms an ingredient of several rocks; its form is an eight-sided prism, with diedral summits. The colour is in general brown or brownish-black, and exceedingly opaque. It is found in most of the volcanic regions, and also in Norway.

*Sahlite* is a variety of massive augite, and of much seldomer occurrence; it also occurs crystallized in the same form, and of a greenish-grey colour. Its name is derived from its locality, on account of being first found at the mine of Sahla, in Westmania.

*Fassaite* is a second variety of augite, though the colour differs materially, being a bright olive-green. It derives its name from being found in the Fassa Thal, in the Tyrol.

*Hornblende* is of a brown, or brownish-black colour, and resembles augite in appearance. It occurs massive, and disseminated in almost every rock. (In the granite of Bohemia, in many varieties of porphyry, and in syenite.) It is also found of a slaty appearance, and is abundant in almost every country. The primitive form of its crystals is an oblique rhomboidal prism. It is plentiful in Scotland, in many parts of Germany, and in Mexico.

The next mineral of this class is *pargasite* (*pargasite*, Häüy and Leonhard). It occurs disseminated in plutonic rocks, in small crystals. Its colour is a light green, approaching to a bluish-green, and it is found at Pargas, in Finland, whence it derives its name. The rhomboidal prism is the primitive form of the crystals.

*Hedenbergite* occurs both massive and crystallized, and of a greyish-green colour. It is a rare mineral, and occurs in the calcarious districts of Bohemia, accompanying the carbonate of lime.

*Carinthin* is another variety of this class, of a greyish-green colour, and occurring massive, though frequently granular or crystallized. It derives its name from its locality.



**MAGNESI-SILICITE** (includes *tremolite*, *schiller spar* and varieties, *anthophyllite*, *asbestos*, *kyanite*, *staurolite*).

*Tremolite* (*grammatite*, Brong.) derives its name from Tremola, a valley in the Alps, where it was first found, though from some accounts it appears to have been first found in Transylvania. The varieties of this mineral differ only in outward appearance, the constituent parts being nearly the same in all cases. It occurs granular, fibrous, asbestous, common and glassy. Its colour is generally greyish-white, though it likewise occurs of a yellowish or greenish tint; it is shining and very brittle. It is found in limestone in the Highlands of Scotland, and the common variety is frequent in Transylvania, Italy, and France. It likewise occurs in basalt in the Castle rock, at Edinburgh. All the varieties lose their colour if subjected to a great heat. Its composition gives rise to the name of the class; and in addition to the above-mentioned earth, there is a considerable proportion of carbonic acid. The average specific gravity is 2.800.

*Actynolite* bears a strong resemblance to the above-mentioned variety, the distinguishing mark being generally the colour, which is green, of a variety of shades. It occurs fibrous, massive, and in elongated crystals. It occurs in Saxony, in Dauphiné, and Cornwall, and from the first-mentioned locality very fine specimens are obtained. It bears some resemblance to pipe schorl, from which, however, it is distinguished by its glassy appearance.

*Schiller spar* (*schiller spath*, Leonh.; *smaragdit*, Karsten) is of a blackish-green colour, passing into olive-green, occurring both massive and in distinct concretions. It is softer than the next variety, from which it can be distinguished by its colour. It occurs in the Island of Skye and in other parts of Scotland, in Saxony, the Tyrol, and Cornwall.

*Bronzite* (*bronzit*, Leonh.; *blaettriger anthophyllite*, Werner; *argile metalloide*, Brong.).—Its colour is greyish-yellow, and it also occurs of a brown shade. It is generally found massive. It has a semi-metallic appearance and lustre, and is difficultly frangible. It occurs with the preceding variety, in the Island of Skye, and in the Styrian Alps, and it derives its appellation from its appearance. Another variety, denominated “hypersthene,” or “Labrador schiller spar,” is found in that peninsula with the felspar, and it likewise occurs in Greenland.

*Anthophyllite* (*anthophyllith*, Leonh.).—Its colour is yellowish-grey or brown. It occurs massive, rarely crystallized, and has a shining lustre. In addition to the characteristic constituents, it contains oxide of manganese, iron, and alumina. It occurs principally in Norway, in primitive rocks.

*Asbestos*.—This class is characterized by its property of resisting heat, and by its great flexibility, on which account it was



employed for weaving cloths which were used to collect the ashes of dead persons after they had been burnt; the value of the amianthus consisted in the length of the fibres, and it was woven with flax, which was afterwards burnt out. In Pliny's Natural History, it is described as growing upon a plant in the most desert regions, and its duration when exposed to the fire is accounted for by its never receiving any nourishment in the situations where it is found.

*Common asbestos* (*gemeiner asbest*, Leonh.; *asbest dur*, Brong.) is either of a greyish or greenish-white colour. It occurs massive, in distinct concretions closely aggregated, and it rarely occurs crystallized (Bournon's Cat. Min. p. 123). It is less flexible than asbestos; it occurs in greenstone and metalliferous beds, in the Island of Skye, in Cornwall, in various parts of Europe, and more especially in the Saxon Erzgebirge.

*Amianthus* (*biegsamer asbest*, Leonh.; *asbest amianthe*, Brong.).—The shades of colour of this mineral are nearly the same as those of the preceding variety, though it has been found blood-red. It occurs in fibrous concretions closely aggregated, and is flexible. It is found in the western islands of Scotland, in Cornwall, in Saxony, and Bohemia, and in Dauphiné in France, and considerable quantities are found in Italy. It also occurs in Asia and America.

*Rock cork* (*bergkork*, Leonh.; *asbeste subériforme*, Brong.).—This mineral has received the different appellations of "mountain cork," "mountain leather," and "mountain paper," according to the various degrees of thickness in which it occurs. The mountain cork occurs in thick masses, filling the cavities of rocks; is rather tenacious, and swims on water. The mountain leather and mountain paper occur in plates, varying in thickness, in serpentine rocks. It occurs in Scotland, at Johann-georgenstadt in Saxony, in Italy, France, and Norway. The specific gravity is 2.410.

*Kyanite*, or *cyanite* (*cyanit*, Leonh.; *disthène*, Brong.).—Its colour is a pale blue, though sometimes it occurs grey or green. It occurs massive, and rarely crystallized, and has a splendid lustre. Some crystals acquire negative electricity by rubbing, others positive. It is found in primitive mountains in Scotland, the Alps, Saxony, Bohemia, Spain, and the Tyrol. It occurs at Airolo on Mount St. Gothard, in a beautifully white mica-slate. It has also been found in Asia and in America.

*Staurolite* (*staurolite*, Brong.; *grenatite*, Jamieson; *grénatit*, Werner).—It is of a reddish-brown colour, occurring only crystallized and opaque. It is found in primitive rocks, accompanying garnet, in Scotland, in the Tyrol, in Spain, France, and the Alps, and in America. This mineral generally contains but little magnesia, though in the specimens from St. Gothard from 1.5 to 2.0 per cent. is found, which gives it its place in this class.

The average specific gravity is 3.00, and all the minerals are difficultly fusible before the blowpipe.

**POTASSI-SILICITE** (includes *jade*, *obsidian*, *gabronite*, *petalite*). *Jade* (*saussurite*, Saussure; *jade de saussure*, Brong.).—Its colour is pea-green, passing into grey, occurring massive, and very hard. It is found in Italy, and recently in New Zealand.

*Obsidian* (*obsidian*, Leonh.; and *obsidienne*, Brong.).—Its colour is black, generally very intense, sometimes uniform, and at other times striped. It is found in Spain, in Ireland, in Siberia, and in the South Sea Islands. It was used by the ancients for mirrors; and by the Spaniards, Mexicans, and Peruvians, it was used for knives, and Mr. Burkart describes the Serra de las Novajas, or mountain of knives, in his work on Mexico. It is a volcanic production, resembling glass. It has been long known, and is spoken of by Pliny under the name of "obsidius." The transparent varieties have received the name of "marekanite."

*Gabronite* (*arcticit*, Werner) is of a greyish-green or greenish-black colour; it occurs both massive and crystallized, though the former is the most common mode of occurrence, and it is very brittle. It occurs in the Saxon Erzgebirge, and is classed under the head of scapolite by Jamieson.

*Petalite* is of a greenish-grey colour, and, like the preceding variety, occurs both massive and crystallized. It occurs in Saxony, Bohemia, and the Alps.

**MAGNESITE**.—This class of minerals derives its name from magnesia being the characteristic ingredient, though, as in some other cases, it is not predominant. In its pure state this earth is of a white colour and earthy taste, with a specific gravity of 2.50.

**HYDRO-MAGNESITE** contains *hydrate of magnesia* (*reine talkerde*, Leonh.; *magnesite*, Brong.).—Its colour is yellowish-grey or white; it occurs massive, and it adheres to the tongue. From the analysis made by Bucholz, it contains 48 per cent. of magnesia, and the rest is carbonic acid and water. It is found in Moravia in serpentine rocks, and in Italy.

*Meerschäum* (*meerschäum*, Leonh.; *écume de mer*, Brong.) is of a greyish-white colour, and occurs massive; it is soft, and adheres to the tongue. Specific gravity, 1.723. It is found in Cornwall, in Moravia, and near Thebes, and also in Asia; in Turkey it is used for the manufacture of pipes, and in Spain it is employed in the manufacture of porcelain.

**ALUMINO-MAGNESITE** contains *pleonaste*, *iolite*. Both these minerals are rare.

*Pleonaste* (*pleonast*, Mohs.; *spinelle pléonast*, Brong.; *ceylanite*, Jamieson) is of a dark green colour, approaching black. It occurs in grains, and crystallized of an octahedral form. It was originally brought from Ceylon, and it is more or less met with in the different volcanic districts.

*Iolite* (*iolith*, Werner ; *iolithe*, Haüy) is of various shades of dark blue, occurring both massive and disseminated, though rarely crystallized. Besides the characteristic constituents, it contains a large quantity of silica. It is found at Salzburg, at the Bay of San Petro, in Spain, and Mr. Heuland's collection contains several very fine specimens of the crystals of iolite from Greenland. It is used as a gem, though its brilliancy is not very great.

**SILICO-MAGNESITE.**—*Chrysolite* (*chrysolith*, Leonh. ; *peridot chrysolithe*, Brong.).—It is of an olive-green colour, translucent, and sometimes transparent. It occurs both crystallized and in grains, and the primitive form is a prism. In addition to magnesia and silica, it contains from 10 to 19 per cent. of iron. It is found in the sand of rivers in the south of Europe, and is brought from the Levant and Upper Egypt.

**FERRO-MAGNESITE.**—*Olivine* (*olivin*, Leonh. ; *peridot olivine*, Brong.) is of an olive-green colour, generally occurring disseminated or in grains, though sometimes massive and crystallized, which, however, is rarely the case. It likewise contains a large per-centage of iron, and it is found in igneous rocks, accompanying augite. Its principal localities are the islands of western Scotland, Iceland, Saxony, Bohemia, Hungary, Italy, Spain, and France ; in Africa, in the island of Bourbon, and in Greenland in America. It is difficultly distinguishable from chrysolite, though in general its colour is less intense.

**CONDRODITE** (*condrodit*, Leonh.) is of a yellowish or reddish-white colour, slightly translucent, and of lamellar structure. It occurs principally massive, and rarely crystallized. It is found at Ersby in Finland, and it contains 22 per cent. of iron.

**CALC-SILICO-MAGNESITE** contains the class of *serpentine* (*serpentin*, Leonh. ; *serpentine*, Brong.), which is divided into two kinds,—common and precious. They are both of a green colour, of different kinds of intensity, in which white veins are frequent. They only occur massive, and have a splintery fracture, and are difficultly frangible. They occur in beds of considerable size in various parts of Scotland and Cornwall, and in Europe, and are found in the Alps, in the Tyrol, and Saxony. When polished, it is a very fine marble, and is much esteemed. The precious serpentine is, however, rare, and bears a much finer polish than the common variety. The specific gravity is 2.561, and they are both infusible before the blowpipe.

**HYDRO-SILICO-MAGNESITE** (contains *steatite* and *chlorite*).

*Steatite* (*speckstein*, Leonh. ; *stéatite commune*, Brong.).—Its colour is white, passing in various shades of yellow, grey, brown, and reddish-white. It occurs massive and in six-sided prisms and rhomboids, and is soft, possessing a greasy feel, without adhering to the tongue. Its specific gravity is 2.671. It traverses serpentine in the form of small veins, and accompanies



some of the metals in their situations. It is met with in Cornwall and Wales, and also in Scotland, and on the continent in all those countries in which serpentine is found. A very beautiful spotted variety is brought from China, where it is employed in manufacturing small figures and other ornaments. French chalk is a preparation of steatite, and is much used for marking on cloths, as the trace is very difficult to be removed, and it is employed as food by the savage tribes of Asia and America, who mix it with flour. The variety from China has received the name of "figure-stone," or "agalmatolite" (*agalmatolit*, Leonh.), and it differs from steatite only in its colour, being somewhat of a darker shade.

**CHLORITE** (*chlorite*, Brong.; *chlorit*, Leonh.) has received a variety of additions to the name, denoting the state in which it occurs; thus the common slate occurs massive, the chlorite slate in beds, and "green earth," when it assumes a green colour and earthy appearance. It is frequently found enclosed in crystals of quartz and adularia, to both of which it imparts a green colour, and the colour of all the varieties is more or less green. The localities, too, are much the same; all the varieties occur in Scotland, in Saxony, in the Alps, particularly Mount St. Gothard, where it encrusts the axinite; and in France in Dauphiné. Some specimens contain iron, which, however, is absent in that brought from Dauphiné, so that it cannot be counted a constituent part. Its specific gravity is 2·612, and it melts into a black slag before the blowpipe.

**YTTRITE** comprehends only one known mineral, which is in itself extremely rare. The properties of the earth are not fully ascertained, though, like all the others, it is white in its native state.

**GADOLINITE** (*gadolinit*, Leonh., Brong., Haüy).—It is of a black colour, very intense, and sometimes flesh-red. It occurs massive in prismatic concretions, and very rarely crystallized, its primitive form being an oblique four-sided prism. It is very brittle, and its specific gravity is 4·082. It contains 45 per cent. of yttria, besides a considerable portion of silica and cerium. It occurs at Finbo in Sweden, and at Ytterby in Roslagen; when exposed to the action of nitric acid, it loses its colour and forms a gelatinous material.

**ALUMINITE** is a very important class of earthy minerals, containing some of the most common minerals. When pure, the earth is of a white colour, and heavier than silex. There is one mineral which bears the characteristic name of this class, viz.

*Aluminite* (*reine thonerde*, Leonh.; *argil native*, Brong.).—Its colour is either white or yellowish-white, and it only occurs in small pieces, which absorb water, and slightly adhere to the tongue. Its composition is alumina 32·50, water 47·00, sulphuric acid 19·25, silica 0·45, lime 0·35, iron 0·45. (*Simon*. in



Allgem. Journ. der Chemie, 5 Jahrg. S. 137.) It has hitherto been only observed in Germany near Halle, and at Newhaven in England.

FLUOR-ALUMINITE (contains *topaz*, *kollyrite*).

*Topaz* (*topaz*, Leonh., Brong.).—Its colour is yellow, passing from nearly white into very intense yellow. It occurs massive, though very seldom, but most frequently crystallized, of which the primitive form is an oblique prism. When exposed to heat, topaz becomes white, but the Brazilian topaz, on being similarly exposed, becomes rose-red. The topaz becomes electrical by friction, which property it retains for a considerable time. In addition to alumina and fluoric acid, it contains silica. In Scotland it is obtained from Cairnaghorm, and it is also obtained in Cornwall. In Bohemia and Saxony this mineral is also found, and also at Hirschberg in Silesia. It is found in Asia in Ceylon, Pegu, Hindostan, and Kamscatka, and in America it is found at Villa Rica in Brazil. It is found in primitive rocks, either lining cavities, or aggregated with felspar, schorl, and quartz, whence it bears the name of “topaz rock.” It has long been known, for mention is made of it in ancient history, when Cleopatra gave Antony a very fine stone; and in several mineral cabinets of Europe are engraved specimens of this gem. It is much valued for ornamental purposes. The Cairnaghorm quartz bears a strong resemblance, but it may be distinguished by its want of brilliancy, and its not becoming electric by rubbing.

*Kollyrite* is another variety of this class. Its colour is brownish-yellow, inclining to straw-yellow, and it occurs massive and crystallized. It is found in Saxony and Siberia, and rarely in France.

PYENITE (*pyénite*, Brong.; *schoerlartiger berill*, Werner; *shorlite*, Kirwan).—Its colour is straw-colour, and it occurs massive, and crystallized in hexahedral prisms, which become electric by rubbing. Its constituent parts are—alumina, 51.00; silica, 38.43; fluoric acid, 8.84. (Berzelius.) It occurs at Altenberg in Saxony, at Slackenwald in Bohemia, and in Siberia. It is infusible before the blowpipe, but with borax melts into a white transparent glass.

POTASSI-SILICA-ALUMINITE embraces those minerals known by the name of *Mica* (*mica*, Brong.; *glimmer*, Leonh.).—Their colours are in general greyish-yellow and greenish-grey, passing into brown of various shades. It occurs in a variety of forms, according to the different situations which it occupies. It generally occurs in a slaty form, when it occupies many of the highest situations in chains of mountains, and is itself a primitive rock, succeeding the granite, into which it also enters as a constituent part. The slate is either fine or coarse-grained, and varies in colour in different situations, but for the most part is greenish-grey. It frequently contains precious garnet and pyrope, which are sometimes of a very large size. It also

occurs crystallized, and its primitive form is a rhomboid, the general figure, however, being an equi-angular six-sided table. Its lustre is semi-metallic, and it is flexible when it occurs in plates. Its specific gravity is 2.654, according to the analysis of Haüy. Its localities are too well known to need any description. It occurs in every country in which primitive rocks are met with, but the finest is from Siberia, where it is used for windows instead of glass. It is found on the banks of the Lena. Mica bears a strong resemblance to talc, from which, however, it can easily be distinguished by its greater brilliancy. Gold sand is merely a very fine variety of yellow mica with an extra metallic lustre.

*Andalusite* (*andalusit*, Brong. ; *andalusit*, Leonh.) is of a flesh-red colour, occurring both massive and crystallized, in oblique four-sided prisms, and slightly translucent. It occurs entirely in primitive districts, accompanying felspar and quartz. Its composition is as follows: silica, 32; alumina, 52; potash, 8; oxide of iron, 2. (Vauquelin.) In England it occurs principally at Dartmoor in Devonshire, in Scotland in Aberdeenshire, and at Wicklow in Ireland. On the continent it is principally found in Andalusia, in Bavaria, and at Freyberg in Saxony.

*Pinite* (*pinit*, Brong. ; *pinit*, Leonh.).—It is of a greenish colour, varying from olive-green to blackish-green. It occurs massive and crystallized, the general form of the crystal being an equi-angular six-sided prism. It has a slight greasy feeling, and is soft. It is of rare occurrence in England, having been found only at St. Michael's Mount; but it is more plentiful in Saxony, Bavaria, and the Tyrol. Before the blowpipe it is infusible.

*Bucholzite* is a mineral very lately analyzed, and its name is conferred upon it in honour of Buckolz, a celebrated chemist. It is but imperfectly known, the colour being a light brown, spotted sometimes with white, at other times with black. It was analyzed by Dr. Brandes, who gives the following constituent parts: silex, 46; alumina, 50; potash, 1.5; and oxide of iron, 2.5. It was first observed in the Tyrol, by Dr. Brandes.

POTASS-ALUMINITE contains *lepidolite*, *nacrite*, *lepidolite* (*lepidolith*, Brong. and Leonh.).—The name is of Greek origin, signifying a scaly stone. It is of a light flesh-red colour, occasionally grey, and sometimes purple. It is composed of a number of scales, having a semi-metallic lustre, and it is generally hard. In some, though not in every variety, lithia has been detected; but in general the characteristic ingredients are silica, alumina, and potash: of the latter of these, there is about 9 per cent., which divides it from the preceding class. In addition to these, there is also a trace of fluoric acid, manganese, and water. In primitive countries it is most abundant, occurring at Kra-

disco, in Moravia, in granite, and at Limoges in a vein of quartz; it also occurs in North America, and in Scotland.

*Nacrite* (*erdiger talk*, Leonh.; *talc granuleux*, Haüy; *scaly talc*, Phillips).—It occurs massive, in small scales, closely connected together, and with a slight pearly lustre. Its colour is green or greenish-white, and by this it is easily distinguished from lepidolite. It contains 17 per cent. of potash, with a small proportion of muriatic acid. It occurs at Freyberg in Saxony, and in Moravia and Bohemia.

**HYDRO-POTASS-ALUMINITE** (contains *Haüyne*, *Gieseckite*, *felspar*, *scapolite*); *Haüyne* (*Haüy*, Karsten; *latialite*, Haüy).—It is of a pale blue colour, passing into grey. Its most frequent form is granular; and when crystallized, its figure is a rhombic dodecahedron. Its composition is—silex, 30; alumina, 15; sulphate of lime, 20; lime, 5; potash, 11; oxide of iron, 1; water, 18. It occurs in the Basalt of Andernach, and at Albano in Italy.

*Gieseckite* is so named in honour of Sir C. Giesecké. It occurs crystallized in six-sided prisms, of a brown colour. Hitherto it has only been found at Akulliarasiarsuk in Greenland, whence it was brought by Sir C. Giesecké. (*Vide* Phillips, p. 113.)

*Felspar* (*feldspath*, Leonh.; *feldspath*, Haüy) constitutes a class of minerals agreeing in a great many points with one another. Their chemical composition is always the same, and they all occur both massive and crystallized.

1. *Adularia* (*adular*, Leonh.; *feldspath nacré*, Brong.) is of a white colour, passing into greenish-white. The crystals are four-sided, surmounted by a pyramid of the same number of sides. When polished, it is very splendid, and reflects light, from which circumstance it has received the name of “moon-stone.” The analysis of Vauquelin gave the following result: silex, 64; alumina, 20; lime, 2; potash, 9; water, 5. It occurs in veins traversing granitic rocks, with quartz, and sometimes amianthus. It occurs at Snowden in North Wales, and in the granite of Arran. The finest specimens are, however, obtained from Mount St. Gothard, which are of very considerable size.

2. *Common felspar* (*gemeiner felspath*, Leonh.) varies in colour from white to red, and into various shades of grey and green. It is generally opaque, at other times slightly translucent, and it occurs massive, and crystallized in the form of an oblique four-sided prism, bevelled on both extremities. It contains only a slight portion of water, scarcely 5 per cent. It is a very abundant mineral, being a constituent part of granite and gneiss, and also forming in itself large and massive rocks. It also occurs in the form of veins traversing primitive mountains, and, combined with hornblende, it forms syenite. It is the fundamental constituent of many varieties of porphyry. The localities are too



numerous, and indeed are too well known to require any enumeration, but the most beautiful crystals occur in the Alps, Siberia, and at Carlsbad in Bohemia.

3. *Labrador felspar* (*Labradorische feldspath*, Leonh.; *feldspath opalin*, Brong.).—Its colour is generally grey, but when exposed in certain directions to the light, it displays a variety of colours. It never occurs crystallized, and its specific gravity is 2.692, according to Brisson. It was first brought from the Island of St. Paul, on the coast of Labrador, but it is now found at Laurwig, and Ingermannland in Sweden, and in West Greenland.

4. *Icespar* occurs both massive and crystallized, in long six-sided tables. It is of a greyish-white colour, inclining to yellowish; it is but imperfectly known, though from general characters it belongs to the felspathic class. It is very frangible. Its only locality is Monte Somma, near Naples.

5. *Scapolite* (*scapolith*, Werner; also *arctizit*) occurs massive, either radiated, foliated, or compact, and crystallized in the form of an eight-sided prism. Its colour is red, of rather a pearly lustre, though sometimes dull. It occurs in the Saxon Erzgebirge, and at Arendahl in Norway, as well as in Sweden and Greenland.

6. *Elaolite* (*zeffstein*, Werner; *elaolitif*, Klaproth).—It occurs massive, of a blue colour, generally more or less approaching to green; it also occurs of a red colour. From the analysis of Klaproth, it is ascertained to be constituted of—silica, 46; alumina, 30; potash, 18; water, 2; and also a slight admixture of iron and lime, together amounting to 2 per cent. It occurs at Laurwig in Norway, and also at Stavern in the same kingdom. The average specific gravity of this class is 2.623.

CALC-SILICA-ALUMINITE contains *meonite*, *sommite*, *chiastolite*, *sadalite*, *talc*.

*Meonite* (*méonite*, Haüy) occurs in eight-sided prisms, terminated by tetrahedral pyramids, of a whitish colour, and shining lustre. It contains about .21 per cent. of lime. It occurs at Monte Somma, and also near Rome.

*Sommite* (*nepheline*, Haüy) occurs in grains or in small hexahedral prisms, of a greenish-grey colour, and vitreous lustre. When immersed in nitrous acid, it gradually becomes cloudy internally, whence its name “nepheline.” It occurs at Monte Somma, and also in the lava of the Cape di Bove, near Rome.

*Chiastolite* (*chiastolith*, Leonh.) is of a greyish-white colour on the exterior, but black internally. It occurs in rectangular prisms, and also enters into the composition of the chiastolite slate. Its principal localities are at Wolfscrag, near Keswick, and also in the county of Wicklow. On the continent it occurs in Galicia in Spain, and in the High Pyrenees.

*Sadalite* (*sadalith*, Leonh.) is of a light-green colour, massive,



and crystallized in rhombic dodecahedrons. It is slightly translucent, and yields with difficulty to the knife. It is a rare mineral, having only been found in Greenland and Vesuvius.

*Talc* (*talc*, Leonh. ; *talc*, Brong.) occurs massive, indurated, and in hexagonal crystals. It is composed of a number of plates connected more closely together than mica, and is consequently harder than that mineral. Talc generally occurs of a white colour, passing into yellowish or greenish, and is translucent. It contains but little lime. It is found at Glentilt in Scotland, and at Lizard Point in Cornwall, at Zillerthal in the Tyrol, and also at Salzburg. It was used in former times for polishing gypsum figures, and when pounded, the Persians use it for their houses.

*Corundum* (*corund*, Leonh. ; *corindin*, Haüy) occurs of a greyish, greenish, or red colour, generally translucent, but sometimes opaque and even transparent. It occurs crystallized in hexahedral prisms, and it also occurs granular and compact. It is plentiful in primitive rocks in India and China, and it has been found in Piedmont.

*Ruby* (*rubin*, Leonh.) derives its name from the Latin *ruber*, signifying red, which is its colour. It occurs crystallized in hexahedral prisms, and also in grains, in Ceylon and Pegu. In Europe it is found near Bilin in Bohemia, and at Expailly in France. It is also found at Mount St. Gothard. As a gem, it is highly prized on account of the extreme and rich depth of its colour, and its chatoyant lustre.

*Sapphire* (*sapphir*, Leonh. ; *corindin télésie*, Brong.) occurs principally of a blue colour, passing into a green. It occurs in blunt-edged pieces and in grains, also crystallized in the form of an equiangular six-sided pyramid, with modifications, of which the primitive form is an acute rhomboid. It possesses the property of double refraction, and its specific gravity is 4.320. It occurs in Bohemia, Saxony, France, and Portugal, and in Ceylon and Persia.

*Emery* (*schmiergel*, Werner ; *éménil*, Brong.) occurs of a blackish colour, massive, and of a fine-grained appearance. It is principally found in the East Indies, and it also occurs near Smyrna, in Saxony, and in Guernsey. It is used with water to polish minerals, and with oil to polish metals.

*Automalite* (*authomolit*, Werner ; *spinelle zincifère*, Haüy) is of a dark green colour, and occurs crystallized in the form of an octahedron, and sometimes of a tetrahedron. It occurs in slate at Fahlun in Sweden.

*Ceylanite* (*ceylanit*, Werner ; *spinelle pléonast*, Brong.) occurs of a green colour approaching black, in grains, and crystallized in the form of an octahedron. It occurs at Ceylon, in the sand of rivers near Monte Somma, and in the trap rocks of Andernach on the Rhine.

*Salamstone* (*salamstein*, Werner ; *corindin hyalin*, Haüy) occurs

of a reddish colour, passing on the one hand into a bright red, on the other into brownish and bluish red. It occurs in grains, and crystallized in hexahedral prisms. It is translucent, and occurs only in Hindoostan. The name is the one by which it is known in the Indian peninsula.

**FERRO-POTASS-ALUMINITE** (*Schorl, killinite, rubellane, mellinite, spinellane, natrolite*).

*Schorl* (*gemeiner schorl*, Leonh. ; *tourmaline opaque*, Haüy) occurs disseminated and crystallized in prisms deeply striated longitudinally. It is of a brownish-black colour, opaque, and shining, and passes into dark green. In composition the silica and alumina are generally nearly the same, both averaging about 34 per cent. Its name is derived from the circumstance of its being found at Shorland in Saxony ; but it also occurs in Cornwall, Argyleshire, Perthshire, Bohemia, Hungary, and Spain, principally in granitic, and always in primitive rocks. It occurs in beds, on which account it is easily distinguishable from tourmaline.

*Killinite* is found of a light green colour, occurring massive, and coated by a ferruginous covering, which yields an argillaceous odour when breathed upon. The characteristic constituents are alumina, potash, and iron, but the composition of this mineral is principally silicious. It occurs at Killiney in Ireland, whence its name.

*Rubellane* (*rubellite*, Phillips ; *tourmaline rubellite*, Brong.) occurs of a brownish-red or red colour, passing into pink. It occurs crystallized in indistinct and aggregated masses, on which account it differs from red tourmaline. It occurs in Moravia, at Rozena, and also in Siberia. In America it occurs with green tourmaline in Massachusetts.

*Mellinite* occurs of a brownish-green or brownish-red colour, and opaque. It is found crystallized and massive, and is principally brought from Bohemia and Hungary.

*Spinellane* (*nosin*, Leonh. ; *spinellane*, Haüy) occurs in crystalline masses, of a yellowish-blue colour, and of an hexahedral form. It has only been observed on the borders of the Lake of Leach, in felspathic rock.

*Natrolite* (*natrolith*, Leonh.) occurs of a pinkish or reddish-brown colour, in mammillary masses, presenting a fibrous structure when broken. It occurs in the islands of Mull and Skye, and Rogan on Lake Constance, and at Bilin in Bohemia.

**POTASSI-CALC-ALUMINITE** (*clinkstone, pitchstone, lava, basalt, pumice*).

*Clinkstone* (*klengstein*, Leonh. ; *pierre sonnante*, Brong.) occurs massive, of a yellowish-grey or greenish colour. Its name is derived from the ringing sound which it gives when struck by a hammer. It occurs in the Isle of Mull, and other parts of Scotland ; in Bohemia, the Tyrol, and South America.

*Pitchstone* (*pechstein*, Leonh. ; *petro-silex resinite*, Haüy) occurs of a brown, grey, red, or black colour, massive, and of a slaty structure, possessing a vitreous appearance. It occurs in volcanic districts, associated with lava and pumice, and also in primitive rocks at Freyberg. It occurs in the trap-rocks of Mull and Skye in Scotland, and traverses granite at Newry, in the county of Devon.

*Lava* bears the same name in both German and French. It is difficult to describe the exact substance, for there are so many varieties, that it must be with caution we should give a description of it. By lava, we generally understand that substance which is ejected in a liquid state from the craters of volcanoes, though many varieties bear no traces of the action of fire. Many varieties are also micaceous; some contain leuzite, and others have a fused metallic appearance. By these we generally understand "lava." It is of a brownish or greyish-green colour, porous, and brittle. It occurs principally in the neighbourhood of active volcanoes, though in many cases it is likewise found near those which have long since been inergetic. It occurs in beds in Mexico, near the Rio Grande.

*Basalt* (*basalt*, Leonh.) occurs principally columnar, and also amorphous. It is of a brownish or greyish-black colour, of a granular texture, and opaque. It is very plentifully distributed, occurring in both the old and new worlds. The best examples are, perhaps, the Giant's Causeway, in the county of Antrim, Ireland, and Staffa, on the coast of Scotland. At both these places it occurs columnar, enclosing needle zeolite and mesotype.

*Pumice* (*bimmstein*, Leonh.) occurs of a greyish-brown colour, tinged with red, very porous, and light enough to swim on water. It occurs principally at the Lipari Islands, and but sparingly in the neighbourhoods of Vesuvius and Etna.

HYDR.-ALUMINITE is by no means an important class of mineral bodies, as it includes the single mineral known by the name of "Wavellite" (*wavelit*, Leonh. and Brong. ; *hydr.-argyllite*, Sir Humphrey Davy).—It occurs botryoidal and globular, the internal structure being radiated. It also occurs crystallized, the most common form being a rhombic prism. Its colour varies from greyish to greenish, or brownish-white, semi-transparent, and externally shining. Its specific gravity is 2.270. When heated in mineral acids, it effervesces, leaving very little residue. Its principal component parts are alumina 71.50, and water, 28.0, though in other specimens traces of iron, lime, silica, and fluoric acid have been detected. It was discovered by Dr. Wavell, near Barnstaple, and since then it has also been found in Cornwall, and in Greenland, and Hualgayoc in South America. It occurs in a stalactitic form in Brazil.

7. CALCITE comprehends a useful, ornamental, and greatly diversified class of minerals, many of them highly esteemed.



When pure, the earth is of a white colour ; but in this state it can only be obtained by chemical operations. Its specific gravity is 2·3. Berzelius examined this earth, and found that it was composed of 28 per cent. of oxygen and 72 calcium ; this latter is the metallic basis of chalk, but has not been observed accurately, as it burns with great ardour when exposed to light. It was discovered by Sir Humphrey Davy, who gave it the name “ Calcium.”

*Chalk* (*kreide*, Leonh. ; *chaux*, Brong.) approaches nearest to the chemical element, though it differs but little from the carboni-calcite or carbonate of lime. It is of a white or yellowish-white colour, and occurs massive, adhering to the tongue, and earthy in fracture. It is opaque, with a specific gravity of 2·3. It is one of the most recent secondary rocks, forming large tracts of country, easily distinguished by their smooth appearance. There are at least two layers of chalk, the uppermost containing, in all its situations, horizontal beds of flint, the latter generally abundant in marine productions ; but organic remains are found in all the beds. There are a number of fossils characteristic of the chalk occurring in all the European cretaceous beds, but of the fossils of the American chalk only two have been identified with those of Europe. Annexed is a list of the fossils of the cretaceous system from Phillips’s *Encyclopædia Britannica*, Supplement, p. 157.

Polyparia	..	..	..	..	146	} Varieties.
Radiara	..	..	..	..	85	
Conchif. Plagrin	..	..	..	..	87	
———— Mesom	..	..	..	..	122	
———— Rudista	..	..	..	..	23	
———— Brach	..	..	..	..	67	
Gasteropoda	..	..	..	..	56	
Cephalopoda	..	..	..	..	107	
Crustacea	..	..	..	..	11	
Annulosa	..	..	..	..	30	
Cirropeda	..	..	..	..	2	

The countries in which chalk is principally found are Poland, France, and England. It also occurs in America and Egypt. It is much used in a variety of ways. In Western Norfolk it is used as a building material ; when burnt, it forms lime, which is used for mortar and whiting ; it is also used for polishing and for manure.

CARBONI-CALCITE includes all those minerals known by the name of “ carbonate of lime ” (*kalkspath*, Leonh. ; *chaux carbonatée*, Bour. ; *spath calcatre*, Brong.).—The most perfect form of the carboni-calcite is the “ double refracting spar.” In this state it is nearly pure carbonate of lime. The crystallized form of this spar is the rhomboid, and the colour is white or yellowish-



white. It is principally brought from Iceland, whence its name "Iceland spar." Calcareous spar is not so hard as fluor, on which account it is easily distinguishable from that mineral. Carbonate of lime also occurs crystallized in a variety of forms, upwards of 500 different crystallizations having been observed, and most of them figured in the "*Traité de la Minéralogie par le Comte de Bournon*." The most common variety is the dog's-tooth spar, which occurs very beautifully aggregated at Clifton, in the calcareous rocks on which that town stands. The primary form is the obtuse rhomboid, and the varieties are generally modifications of this figure (Bournon has described fifty-six modifications of this figure, which has greatly been added to by other mineralogists). When laminated, it passes into *schiefer spar* (*schiefer spath*, Leonh. ; *chaux carbonatée nacrée*, Haüy). Its colour is white, passing into reddish or green. It occurs in Saxony, in Cornwall, in Dauphiné, and in Perthshire in Scotland.

*Satin spar* (*chaux carbonatée fibreuse*, Haüy) is so named from its satin-like appearance. It occurs of a whitish-grey colour, at Alston Moor, and is much used on account of the high polish it takes for ornamental purposes.

*Agaric mineral* (*rock milk*, Jamieson) is a rare and beautiful mineral, of a pure white colour, meagre to the touch, earthy, and very light, so much so that it will float for some time on water. It effervesces violently in acids, leaving but a little sediment. It occurs in the crevices of calcareous rocks in Switzerland and in England ; it occurs at Sunderland, and near Chipping Norton in Oxfordshire.

*Stalactitic limestone* occurs mammillated, forming long pendulous masses. The colour varies, though in general it is yellowish-white. The principal localities are—the Woodman's Cave in the Harz mountains, Auxelle in France, in Derbyshire, and in the grotto of Antiparos.

*Common limestone* (*dichter kalkstein*, Leonh. ; *chaux carbonatée compacte*, Haüy ; *secondary limestone*, Phillips) is of a granular appearance, approaching earthy. It occurs of a variety of colours, generally, however, of shades of brown, red, and black. It is a rock of much importance, and spreads into considerable districts, in which veins of metal occur, generally of sulphuret of mercury, lead, and zinc. Several limestones are very fine-grained, and bear a high polish, on which account they are much valued as marbles. The beautiful white variety from Carrara is the most valuable, and is much used in sculpture. The varieties are exceedingly numerous, and derive their names either from their locality or their appearance.

*Oolite* (*roogenstein*, Werner ; *roestone*, Jamieson) is another variety of limestone, found massive, and in large beds ; it increases its hardness upon exposure. It is common in many

parts of England, particularly near Bath, and on the continent it is also found. It abounds in fossils. Its name is derived from the small granular texture it possesses.

*Peastone* (*erbsenstein*, Leonh. ; *chaux carbonatée concrétionnée globuli-forme testacée*, Haüy) has also received the appellation of "pisolite." It is generally of a white colour, approaching somewhat to brown, and the grains vary in size. It is brittle and soft. It occurs at Carlsbad in Bohemia, where it is formed by the rotatory motion of the water rising from the cretaceous bed, and the same reason is perceptible in the water of the baths of St. Philip's, in Tuscany.

*Madrepomite* (*lucullite*, Jamieson ; *madrepomite*, Brong.) occurs in roundish masses, indistinctly lamellar, and somewhat curved. It is opaque and of a greyish colour. It occurs at Stavern in Norway, at Salzburg, and in Greenland.

\* \* \* \* \*

When substances are exposed to the action of water containing particles of cretaceous matter in solution, they become coated in a longer or shorter space of time with a covering of cretaceous matter, white in appearance, except when iron enters into the composition, when they assume a reddish-brown colour. The time which is required for the completion of the process varies according to the nature of the spring which contains the chalk. That of Carlsbad requires a week to form a slight covering, whilst that of Tivoli performs the same in two days. Through the kindness of Professor Leonhard, we have been favoured with the sight of some entire bunches of grapes which had been exposed to the action of the waters of the latter place, the globular form being perfectly preserved ; on breaking one of the globules, however, there was merely a hollow, in which was a shrivelled remnant of the grape, proving thereby that the process must have taken place rapidly. We have likewise seen specimens of Tufa (this is the name given to the *petrefactions*) (*versteinerungen*), in which the moss still remains green.

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Another process, equally interesting, is that of the formation of the *calc sinter* (*kalk sinter*, Leonh.) ; the best example of which may be said to be in a Roman arched drain near Cologne. The deposit is striated, not always horizontally, but sometimes also curved, and of yellow and brown colour. The bottom of the drain is covered with a coating of this horizontal calc sinter, and towards the surface it is more curved, proving that the water was agitated at the time of the deposition of the uppermost layers. This marble receives a high polish, and is employed for the altarpieces of many churches in Germany. These three different processes, by which minerals are continually being formed, cannot fail to be interesting, as they show that minor changes are continually going on imperceptibly.

STRONTI-CALCITE contains *arragonite* (*arragonite*, Haüy ; *arragonit*, Leonh.).—It occurs massive, radiated, and crystallized in the form of a six-sided prism, with the lateral facets marked by a longitudinal crevice. The crystals are transparent, and of a yellowish or whitish colour. It derives its name from its having first been observed at Arragon in Spain ; it also occurs at the Dufton lead-mines, near Ilfracombe, in Durham, at Salzburg, and at Marienberg in Saxony. According to the analysis of the Rev. J. Holme, it consists of carbonic acid, lime, and water ; but from another analysis it is constituted of lime 94·5, carbonate of strontian 3·9, iron 0·7, water 0·3 (Stromeyer's analysis of a specimen from Arragon).

MAGNESI-CALCITE contains *bitter spar*, *pearl spar*, *brown spar*, and *dolomite*.

*Bitter spar* (*bitter spath*, Leonh. ; *chaux carbonatée magnésifère primitive*, Haüy) is commonly found crystallized in the form of an obtuse rhomboid. The colour is greenish-grey or yellow. It is distinguishable from calcareous spar only by analysis, which proves its composition to be—carbonate of lime, 68 ; magnesia, 25·50 ; alumina, 2 ; iron, 1 ; and water, 2. It occurs at Loch Lomond in Scotland, and also in the Isle of Man. It is also found in Sweden, the Tyrol, and North America.

*Pearl spar* (*spathiger braunkalk*, Leonh. ; *chaux carbonatée ferro-magnésifère*, Haüy) is classed by Jamieson under the name of brown spar, from which, however, it differs materially in colour. Pearl spar occurs massive and crystallized in obtuse rhomboids, with a pearly lustre, and of a white or yellow colour. In addition to the characteristic ingredients, it contains a large proportion of carbonic acid, and a trace of iron and manganese. It is soluble with slight effervescence in muriatic acid. Its localities are in Derbyshire, Devonshire, and Cornwall, and with sulphuret of zinc in Durham.

*Brown spar* has been described by Phillips as a carbonate of iron, from which, however, it is easily distinguished by its composition. It occurs in the same form, and under the same circumstances as the preceding mineral, but it is not so abundant. It is of a reddish-brown colour, with a slight pearly lustre ; like the preceding variety also, it effervesces slightly in acids. Its composition is as follows : lime, 43 ; magnesia, 10 ; iron, 8 ; manganese, 3 ; and water, 26. It accompanies calcareous spar, heavy spar, fluor, galena, iron pyrites, and silver ; and it is principally found in Cumberland and Derbyshire, and on the continent in Norway, Sweden, France, Saxony, and Hungary.

*Dolomite* (*dolomit*, Leonh. ; *chaux carbonatée magnésifère*, Haüy) occurs of a whitish colour, both massive, granular, flexible, and columnar. It is soft, yielding to the nail. Its composition is—40 carbonate of magnesia, and 59 carbonate of lime. It is found in France, Saxony, Sweden, and Spain. Its



name was given in honour of Dolomieu. It resembles granular limestone, but it effervesces very feebly in acids, which distinguishes it.

*Magnesian limestone* (*brown dolomite*, Tennant) is of a yellowish colour, and occurs massive, with a granular texture. It is composed of lime, magnesia, and a large per-centage of carbonic acid. In the north of England it occurs in beds of considerable thickness, and it likewise occurs in Durham, Northumberland, and Derbyshire.

PHOSPHORI-CALCITE contains the mineral known by the name of *apatite* (*apatit*, Leonh. ; *chaux phosphatée*, Haüy), which occurs crystallized in six-sided prisms, terminated by a six-sided pyramid. It is of a white, yellow, green, or red colour, sometimes all occurring in the same crystal. It is composed of—lime, 54.28 ; phosphoric acid, 45.72. It occurs in the granite of St. Michael's Mount, and also near St. Agnes in Cornwall. It likewise occurs in Bohemia and Saxony, with tin.

*Phosphorite* (*phosphorit*, Leonh.) is the name given to the massive variety of this mineral.

FLUORI-CALCITE includes a very important, though simple class of minerals, from which the powerful acid called "fluorine," which has such an affinity for silex, and consequently for glass, is obtained. It occurs massive and crystallized in a variety of forms, of which the primitive and most common is the cube. The crystallizations being important, I will give a list :—

1. The cube.
2. The cube truncated on all the edges.
3. The cube with truncated angles.
4. The rhomboidal dodecahedron.
5. The octohedron.
6. The octohedron with the solid angles replaced by square planes.

The octohedron is, however, a very rare form of this mineral. The colour of it is also various, as it occurs both blue, green, purple, yellow, white, brown, and rarely, however, light red, approaching lilac. The specimens of the cube fluor, truncated both on the sides and angles, are rare, more particularly the former, which gives the specimen the appearance of being marked round the squares of the cube with a white line. The crystals of all the varieties are generally aggregated, and the specific gravity is 3.0943, according to Haüy. Before the blow-pipe it melts into a white glass, losing all its colour. If sulphuric acid is added to the fluor spar, when pounded and heated, a very penetrating and offensive vapour is produced, which bears the name of "fluorine," the properties of which I have already mentioned. It forms large beds in some countries, and in others it occurs in veins, aggregated with carbonate of lime, spathose iron, quartz, and blende. It is very plentiful in Dur am, tra-



versing veins of sulphuret of lead. It likewise occurs in Derbyshire, and associated with tin and copper in Cornwall, but it is rare in Scotland. On the continent it is abundant, in Saxony, the Harz mountains, Norway, and sometimes in Italy, and it is common in America. Its name is derived from the mineral being used, when pounded, as a flux for metals; and it is employed in Derbyshire for the manufacture of ornamental vases, &c. Its resemblance with calcareous spar, though deceiving in some cases, is easily detected, for it does not effervesce, as calcareous spar, in acids.

SULPHURI-CALCITE includes *anhydrite*, *vulpinite*, and *gypsum*.

*Anhydrite* (*vulpinit*, Leonh.) occurs massive, crystallized, granular, and fibrous, of a whitish, greyish, or bluish colour. It occurs at Hallein, the Tyrol, and in Carinthia and Austria. Its composition is—lime 40, and sulphuric acid 60, though in some varieties a trace of muriate of soda has been detected, when it is called *muriacite* (*cube spar*, Jamieson; *wurfelspath*, Leonh.).

*Vulpinite* (*siliciferous anhydrous gypsum*, Phillips) is found in laminated concretions, of a whitish colour. Its composition is—sulphate of lime 92, and silex 8. It occurs at Vulpino in Italy.

*Gypsum* (*gyps*, Leonh.; *chaux sulphatée*, Haüy) occurs fibrous, compact, and earthy. It occurs of a whitish or reddish colour, and sometimes yellow. It is slightly translucent. It occurs principally in the chalk formation of Paris, and it likewise occurs in Switzerland and Bavaria. In England it occurs in Derbyshire, Devonshire, and Yorkshire.

There is also a crystallized variety which bears the name of *selenite* (*chaux sulphatée cristallisée*, Haüy). The form is an oblique parallelepiped. The colour is the same as that of gypsum. It occurs at Alston in Cumberland, and in Oxfordshire. It is also found in the London clay, and in Bohemia and Siberia.

NITRO-CALCITE includes *nitrate of lime* and *dathalite*.

*Nitrate of lime* (*chaux nitratée*, Haüy) occurs efflorescing, and sometimes pulverulent. It is soluble in water, and is found on old walls and calcareous rocks, and it is very bitter. Its composition is lime 32, nitric acid 57.44, and water 10.56.

Intermediate between this and the next class stands the mineral known by the name *dathalite* (*datholit*, Leonh.; *chaux boratée silicieuse*, Haüy), which occurs of a greenish or greyish colour, and is slightly translucent. It occurs massive and crystallized, in the form of a rhombic prism, with the edges and angles replaced by planes. It contains, as well as nitric acid, a portion of boracic acid. It has been found at Arendahl in Norway.

BORA-MAGNESI CALCITE contains the mineral known by the name of *boracite* (*borazit*, Leonh.; *magnésie boratée*, Haüy).—It occurs crystallized, in the form of a cube, with the edges re-

placed, and the diagonally-opposed solid angles differently modified. It is of a whitish or greenish colour, and is composed of lime, boracic acid, and magnesia. It occurs at Kalkberg in Brunswick, and also in Holstein.

BARYTES, the characteristic earth of the next class, is of a white colour, with a caustic taste. It consists of 90 per cent. of a metallic base termed "barium," and 10 of oxygen. It has never been found pure, but always in combination with either carbonic or sulphuric acid, forming minerals, which can easily be detected by their great weight. Barytes is a violent poison.

CARBONI-BARYTE is the name given to those minerals in which barytes is combined with carbonic acid. It includes only one mineral, known by the name of *witherite* (*witherit*, Leonh.; *baryte carbonatée*, Haüy).—It occurs massive, crystallized in the form of an hexahedral prism, terminated by six-sided pyramids, and also stalactitic. It is of a whitish, greenish, or yellowish colour, slightly translucent at times, but more frequently opaque. From analyses of specimens from Styria, its composition is, barytes 78, and carbonic acid 22. It was discovered by Dr. Withering, after whom it was named, in Lancashire; and it also occurs in Shropshire, near St. Asaph in Flintshire, and Styria and Salzburg.

SULPHURI-BARYTE is barytes in combination with sulphuric acid, and from its weight this class has received the name of *heavy spar* (*schiver spath*, Leonh.; *baryte sulphatée cristallisée*, Haüy).—It occurs both massive and crystallized. The primary form is a right prism, with rhombic bases. Its constituent parts are barytes 67, and sulphuric acid 33. The principal localities where this mineral is obtained are in Cornwall, at Alston Moor, and near Babbicombe Bay in Devon. It occurs at Schriesheim, near Heidelberg. When fibrous, it is called "Bolognian stone," from its occurring near Bologna. By German mineralogists it is termed "Bologneser spath."

STRONTIAN, the characteristic earth of the next class, occurs white. It is composed of 16 per cent. of oxygen, and 84 of strontian—a metal which was first noticed by Sir Humphrey Davy.

CARBONI-STRONTITE includes the mineral known by the name of *strontianite* (*strontian*, Leonh.; *strontian carbonatée*, Haüy).—It occurs massive and crystallized, of which the primitive form is the right rhombic prism. It is composed of strontian 70, and carbonic acid 30. Its name is derived from the place where it was first observed, namely, at Strontian in Scotland; it also occurs in Saxony.

*Sulphuri-strontite* is the chemical name for *celestine* (*celestin*, Leonh.; *strontian sulphatée*, Haüy).—It occurs of a white or yellowish-white colour. The primitive form of the crystal is the same as the preceding variety. It also occurs stellated. Its

localities are the south-westerly portion of England, more particularly Devonshire and Somersetshire. It also occurs in Yorkshire and Westmoreland, and on the continent at Montmartre. It likewise occurs with sulphur in Sicily.

There now remain but a few of the earthy minerals, which from their composition cannot be classed under any particular head. These are the alkaline minerals, one or two of which are but imperfectly known, and which consequently cannot have any place assigned to them in the chemical classification.

**ALUMINO-POTASSITE** (*alum*, Phillips; *alaun*, Leonh.; *alumine sulphatée alkaline*, Haüy) occurs principally as an efflorescence on argillaceous minerals. It occurs in slate, and forms stalactites, of a whitish or pinkish-white colour. Its composition is, sulphuric acid 76, alumina 12, and potash 3. It occurs in England near Whitby, and also in Scotland; and it is likewise found in Norway, Bohemia, and Hungary.

**NITRA - POTASSITE** (*nitre*, Phillips; *naturlischer salpeter*, Leonh.; *potasse nitratée*, Haüy) occurs in crusts of a whitish or yellowish-white colour. It occurs on old walls, or chalk, situated in damp places. It can also be produced artificially by exposing animal refuse to the action of the atmosphere, by which means azote is disengaged and combines with the oxygen, forming nitric acid; and this again combines with the potash in the vegetable matter, and forms nitre. It is the principal constituent part of gunpowder, the sulphur being employed on account of the facility with which it burns, and the charcoal on account of its readily igniting, for the principal object in the manufacture which has to be observed, is so to surround the nitre with inflammable substances that it may readily take light, and disengage the greatest possible quantity of gas in as short a time as possible.

**CARBO-SADALITE** (*natron*, Phillips; *mineral alkali*, Leonh.; *soude carbonatée*, Haüy) occurs massive, radiated, efflorescing, and in the form of crusts. It is of a grey or yellowish-white colour, and it has a very saline taste. It occurs in the waters of some hot springs, more particularly in that of Carlsbad, and also in lakes which are dried up in summer, in Hungary and Egypt. The natron appears efflorescing on the soil, and when gathered, re-appears in a few days. It is almost always combined with *sulphuri-sadalite* (*sulphate of soda*, or *glauber salt*), which resembles it in colour and general appearance.

**BORO-SADALITE** (*borax*, Phillips; *soude boratée*, Haüy) occurs in prismatic crystals, of a translucent white, blue, or green colour. It occurs principally in Thibet, and in its rough state is called "tincal."

**MURIO-SADALITE** (*common salt*, Phillips; *gemeiner steinsalz*, Leonh.) occurs in beds, and also crystallized in the form of a



cube. It has a shining lustre, and when pure is perfectly white and transparent ; but when combined with clay it becomes brown, grey, red, blue, and green. It is a very abundant mineral, occurring in large beds, and in the waters of springs and lakes. It is an ingredient in the waters of the ocean. It occurs principally at Northwich in Cheshire, Droitwich in Worcestershire, and on the continent in Savoy, Germany, Spain, and Russia.

*Salammoniac, or muriate of ammonia*, is by no means a plentiful mineral. It occurs principally in crusts, though likewise in crystals. Its colour is grey, green, or brownish-black. It is insoluble in water, and may be reckoned among the productions of recent volcanic regions. It also occurs in Tuscany, Germany, and Persia, and it is said to occur in the northern coal-field of England. It has not been carefully analyzed, but it is composed principally of ammonia and soda.

*Pollyhallite* generally occurs fibrous, of a brick-red colour, seldomer compact, of a transparent white. It is difficultly fusible before the blowpipe, but tinges borax brown. It has not been analyzed with accuracy. It occurs at Ansen, in Steyermark with rock salt, and also in Upper Austria.

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## CLASS II.—METALS.

By *native metals* we understand all those metallic bodies which occur pure in their native state, though there are but few of them ; the rest are denominated according to their composition, either *sulphurets* (when sulphur enters into combination with the native metal), *oxides* (when the metal combines with oxygen), or *arseniates* (when combined with arsenic), and so forth. The systems of metallic mineralogy have, taken as a whole, been better managed than the earthy minerals, for we find, in a greater or less degree, that they have received a chemical nomenclature, with the exception of a few, which have retained the same appellations from their localities or discoverers.

In this division of the treatise we shall, therefore, endeavour to show the importance which must be attached to the greater number of them, and where space will permit, we shall endeavour to give the method in which they are purified, thus endeavouring to combine simple metallurgy and metallurgical processes with the study of metallic mineralogy.

The order in which they are arranged deviates, perhaps, from many other systems, but their relative value, not in the pecuniary point of view, but in their use or scarcity, has induced us to follow Jamieson's system of order in this case ; and at all times the uses of the metals perhaps form the best systematic arrangement.



**PLATINA** (*platin*, Leonh. ; *platin natif ferrifere*, Haüy) is one of the rarest metals, and being the hardest, is consequently used in all cases where extreme nicety is required ; and by opticians it is much used in instruments, either mathematical or astronomical, for those parts on which scales of measurement are marked, or which are exposed to great heat. It is of a steel-grey or silver-white colour, occurring in very small grains, which are rarely large, and is nearly as hard as iron, being malleable and ductile, with a specific gravity of 15·601 (Tralles) ; 17·7 (Wollaston) ; and, when purified, 23·0. It is infusible except before the oxygen blowpipe, and is soluble in nitro-muriatic acid. Till very lately it was only found in South America, and there only in Brazil, Peru, and Rio del Pinto. Lately, however, it has been found of a much larger size in the Ural mountains, between Russia and Siberia. It occurs only in small quantities, associated in the sand of rivers or alluvial districts with grains of gold, magnetic iron, and zircon. It is much used for crucibles in chemistry, and also for reflecting-mirrors. It is also employed in porcelain painting, in the place of silver, as it does not tarnish so easily as silver, and is of nearly the same colour. In Russia it is coined, the smallest coinage being of the value of 16s. 8d., or thereabout.

**PALLADIUM** (*palladium*, Wollaston), like the preceding metal, occurs of a silver-white or steel-grey colour, and likewise in small grains, but may easily be distinguished from it by its smaller specific gravity, which is only from 11·0 to 12·1 ; and it is likewise easily detected by its solubility in nitric acid, to which it imparts a deep red colour. It is likewise infusible, except when mixed with sulphur, when it readily melts. It occurs in the same localities as platina, and is perhaps preferable to that metal in the manufacture of delicate instruments, except when required for a very great heat.

**IRIDIUM** and **OSMIUM** are always found associated with one another, in small grains of a steel-grey colour. Its specific gravity is 19·1, and when fused with nitre it acquires a dull black colour, but recovers its original lustre and colour by heating with charcoal. It occurs with platina in the alluvial soil of South America, and was first noticed by Wollaston. It is exceedingly rare.

**GOLD** (*gold*, Leonh. ; or *natif*, Brong.) occurs of a bright yellow colour, inclining to brass-yellow and greyish-yellow. It occurs granular, capillary, and crystallized in hexahedrons and octahedrons. It is shining externally, with a metallic lustre, very malleable, and its specific gravity is 17·6 to 19·2. It generally contains a small portion of silver or copper. It occurs in primitive rocks, rarely in sandstone, and also in the alluvial sands of rivers. It has been found in small quantities in various parts of England, Scotland, and Ireland, but there are no mines

in this country which are worked for gold alone. On the continent of Europe the oldest known locality is Pesterana in the Alps, where it occurs minutely disseminated in sulphuret of iron. It is also found at Gardette in France, in Upper Hungary, and in granite at Salzburg, and in Spain. In Asia it occurs in Thrace and Macedonia, in Siberia, Java, Japan, Formosa, Borneo, and Sumatra. In Africa it is principally obtained by washing the sands of rivers in the neighbourhood of Zahara, the Gambia, Senegal, and Niger, and is collected and brought to market in quills. In the New World it occurs principally in Peru and Mexico, in primitive rocks. The principal portion of the Mexican gold is obtained in the province of Oaxaca, and the mines of Rio San Antonio are much famed for their produce. The following are the most remarkable pieces of gold:—From Paraguay, 50 lbs. weight; La Paz, in Peru, 45 lbs. ditto; Choco, 25 lbs. ditto. In North Carolina it occurs in granitic rock, and also in the state of Virginia, in quartz. The ancients denominated gold in combination with silver, *electrum*, which, from Klaproth's analysis, averages gold 64, and silver 36 per cent. It occurs in the sand of the Rhine, at Schlangenberg in Siberia, and at Wicklow in Ireland.

SILVER is a metal of much value, on account of the incapability of tarnishing easily, and its rarity. It has been known from the earliest times, and used for ornamental purposes, such as the manufacture of vases, &c., and for the coinage of different countries, for which purpose it was first used by the Greeks. The following are the forms in which it occurs:—

1. *Antimonial silver* (*spiesglanz silber*, Leonh.; *argent antimonial*, Brong.) occurs of a white metallic colour, disseminated, massive, and crystallized in rectangular four-sided prisms, longitudinally streaked; its specific gravity is 9.4 (Haüy). It contains 11 per cent. of antimony, though in some specimens 24 per cent. has been detected. Before the blowpipe the antimony is volatilized with its usual odour, and leaves a mass of pure silver. It occurs in the Andreasberg mine in the Harz, in Spain, Suabia, and France.

2. *Molybdic silver* (*molybdaen silber*, Leonh.) is of a steel-grey colour, occurring crystallized in hexahedral prisms, of a metallic appearance. Before the blowpipe it melts into small globules, of a yellow colour, and somewhat tarnished. It occurs at Pilsen, in Hungary.

3. *Sulphuret of silver* (*glanzerz*, Leonh.; *argent sulphuré*, Brong.; *silver glance*, Jamieson) occurs of a dull grey colour, of a metallic appearance, which, when exposed to the atmosphere, becomes covered with a steel-coloured tarnish. It occurs massive principally, and sometimes crystallized in the following forms; viz., the cube, the octahedron, and rhomboidal dodecahedron. When exposed to the action of fire, the sulphur is evaporated,

and a bead of pure silver remains. Its constituent parts are silver and sulphur, the latter entering into its composition in the various proportions of 15, 16, and 25. Its specific gravity is 5·8. It is the most plentiful of the ores of silver, occurring in veins traversing primitive and secondary rocks, but principally in gneiss and granite. It is generally associated with lead and copper, and in combination with gold it forms the metal known by the name of *electrum*. It occurs with lead in the mines of Cornwall and Devonshire. In the Harz mountains, at Schemnitz in Hungary, Joachimsthal in Bohemia, and Schlangenberg in Siberia. It is frequent in Mexico, more particularly in the mines of Guanaxuato, Zacatecas, and Halpujahua. It is extracted from the ore by the process of amalgamation with mercury. The red variety (*rothgültigerz*, Leonh.) is so named on account of its colour.

4. *Bismuthic silver* (*wismuth silber*ez, Leonh.) occurs of a lead-grey colour, disseminated and crystallized. It is easily distinguished from sulphuret of silver by the metallic globules which ooze out when exposed to the flame of an oxygen blow-pipe. It contains the following proportions of metallic elements:—bismuth 27, lead 33, silver 15, iron 4·30, copper 0·90, and sulphur 16·30. It has only been found in the Black Forest, in a vein traversing gneiss.

5. *Carbonate of silver* (*kohlensaures silber*, Leonh.; *argent carbonaté*, Haüy) occurs of a greyish-black colour, massive, and glistening. It effervesces in nitrous acid. It contains about 12 per cent. of carbonic acid, and 15·5 of antimony, the remainder consisting of silver. It occurs at Altwolfach in the Black Forest, in primitive rock, accompanied by sulphuret of silver and native silver.

6. *Muriate of silver* (*silber hornerz*, Leonh.; *argent muriaté*, Brong.; *hornerz*, Werner) occurs of a greenish, brownish, or reddish-blue colour; massive, investing, and crystallized in cubes, slightly translucent, and sectile. It is fusible in the flame of a candle, and when exposed to the heat of a flame urged on by a blowpipe, it melts into a metallic globule, and emits the same vapours as muriatic acid. It occurs in primitive rocks, in veins in which other ores of silver and lead are found, in Huel Mexico mine in Cornwall, and also in Saxony, the Harz mountains, France, and Siberia. It also occurs in Peru.

MERCURY is the only metal which occurs liquid in its native state, and its ores are by no means numerous. In combination with sulphur, it forms the sulphuret of mercury, and it is also met with in combination with silver and silex. It is thirteen times heavier than water.

*Native fluid mercury* (*gediegen quicksilber*, Leonh.; *mercure natif*, Brong.) is of a silver-white colour, and occurs in small globules, in the crevices of rocks, particularly in those in which



the sulphuret of mercury is found. It is found at Idria in Saxony, in Bavaria, and in Spain, and is employed for the process of amalgamation, on account of the property it possesses of volatilizing at a lower temperature than red heat.

*Sulphuret of mercury* (*cinnabar*, Phillips; *zinnober*, Leonh.; *mercure sulphuré*, Haüy) occurs of various shades of red, passing from vermilion to carmine. It occurs most frequently massive, rarely crystallized, in acute rhomboids. According to the analysis of Kalproth, it consists of 84.50 quicksilver, and 14.75 sulphur. It occurs in the sandstone and shale formations, rarely in the clay-slate, and is generally accompanied by the native quicksilver. It occurs in the same localities as the preceding variety. When combined with bitumen, the colour is more dull, and this variety is then known by the name of *bituminous cinnabar*.

COPPER is the next metallic element which deserves our attention, as it occurs very plentifully in nature, and enters into the composition of other minerals. In its native state it is tenacious and malleable, and eight times heavier than water. It is a very useful metal, forming several alloys, viz.—

Copper + zinc = brass.

10 copper + 2 tin = bell-metal.

2 copper + 1 tin = speculum.

It occurs principally in primitive countries (many of the Cornish mines are situate in this description of country, while others are found in the argillaceous schistus, commonly called killas).

Copper occurs in the native state (*gediegen kupfer*, Leonh.; *cuiivre natif*, Brong.) in a variety of forms, either in rolled pieces, in sheets, dendritic or massive. It is of a copper-red yellow, incrustated in many cases with green. It has been found crystallized in the form of a cube and modifications of the same figure, but they are generally very minute and imperfect. It is flexible, though not elastic, malleable, and difficultly frangible. Specific gravity, 8.4. Native copper is composed almost entirely of copper, generally with a small proportion of gold or iron, and it is the only metal which occurs plentifully in the native state. The rocks which contain veins of this metal are generally primitive; sometimes, however, it is found in the older secondary rocks, as greywacke and granular limestone. It is found in Cornwall, in Norway, and at Fahlun in Sweden; in the Saxon Erzgebirge, Oberstein, Salzburg, and near Lyons in France; near the Coppermine River in North America, and at the foot of the volcano of Zurullo in Mexico. One of the largest masses known weighs 2,600 lbs., and was found in Brazil.

*Ferrate of copper* (*grey copper*, Phillips; *fahlerz*, Leonh.; *cuiivre gris*, Haüy) is of a steel-grey colour. It occurs massive, and crystallized in the form of a tetrahedron. It is composed of



copper 52, iron 23, and sulphur 14. It also occurs with a proportion of arsenic (arsenical ferrate of copper), and antimony (antimonial ferrate of copper), and, rarely, with a small portion of platina. It occurs in the same localities as native copper, and is accompanied by the various ores of copper, but is less frequent in Cornwall than the other varieties.

*Sulphuret of copper* (*copper pyrites*, Jamieson; *yellow copper*, Jamieson; *kupferkies*, Leonh.; *cuivre pyriteux*, Brong.) occurs of various shades of yellow, crystallized in tetrahedrons, with the solid angles replaced. It also occurs botryoidal and amorphous, and often beautifully variegated. It can easily be distinguished from iron pyrites by its yielding to the knife, which iron pyrites does not. It always contains a large proportion of iron and sulphur; it is separated from the latter by roasting, and the residue is boiled in nitric acid, from which the iron is discharged by the addition of ammonia. It is the most abundant of all the ores of copper, accompanying not only the other ores of the same metal, but likewise those of lead, iron, and nickel. Very fine specimens are obtained from the Tincroft mine in Cornwall. When arsenic enters into the composition (*arsenical sulphuret of copper*), the colour changes into a yellowish-white, which easily tarnishes. Before the blowpipe it emits white arsenical vapours, by which it can be easily distinguished from copper pyrites. It has been found at Huel Gorland, in Cornwall. The greatest proportion of the copper which is manufactured in England is from this ore. The annual produce of the copper-mines of England alone is estimated at 80,000 to 100,000 tons of ore, or about 8,000 tons of pure metal, which averages from 85*l.* to 90*l.* per ton.

*Oxide of copper* (*red oxide of copper*, Phillips; *rothkupferer*, Leonh.; *cuivre oxidé*, Brong.) occurs of various shades of red. It is transparent or translucent, occurring in octahedral crystals, generally minute, and with a specific gravity of 4.9. It occurs in several of the mines of Cornwall, and the Harz, and also in Norway, Sweden, and South America. The constituent parts are, copper 88, and oxygen 12. Before the blowpipe it is easily reducible to a metallic globule.

*Carbonate of copper* (*malachit*, Leonh.; *cuivre carbonaté*, Brong.; *malachite*, Phillips) is a very important division of the ores of copper. There are three varieties—the green, blue, and crysocola. The first occurs of various shades of green, fibrous, and sometimes stellated. Before the blowpipe, upon borax, it is reducible to the metallic state, and gives a green colour to the borax. The average proportion of carbonic acid is 19 per cent. It occurs with all the other varieties of copper, in all their localities; but the finest specimens are from Siberia. It is susceptible of a very high polish, and is used on that account for ornamental purposes.

*Crysocolla* (*krupfergruen*, Leonh.) is the name given to that

variety which, in addition to the carbonic acid, contains silica and water. It is of a bright green colour, occurring botryoidal, massive, and stalactitic. It accompanies the carbonates, and is found in Bohemia, Siberia, and Cornwall. It occurs also in Mexico.

*Hydro-carbonate of copper* (*blue carbonate of copper*, Phillips; *kupferlazur*, Leonh.; *azure cuivre*, Brong.) occurs of a dark blue colour, crystallized and botryoidal. It accompanies the green carbonate, and is found in Chili, Bohemia, France, and Saxony. Fine specimens are obtained from Huel Unity mine in Cornwall.

*Sulphate of copper* (*blue vitriol*, Phillips) is of a blue colour, and occurs massive, stalactitic, and botryoidal. It consists of copper 33, sulphuric acid 30, and water 27. It occurs in Cornwall, and plentifully in the mines of Saxony; it also occurs in Cuba, and in Mexico. Sulphate of copper can be prepared artificially, but then forms into crystals, in which state it is rarely found in nature.

*Phosphate of copper* (*phosphor kupfer*, Leonh.; *cuivre phosphaté*, Brong.) generally occurs crystallized, of a blackish-green colour, generally translucent. In some cases it occurs of a yellowish-green colour, and crystallized in prisms, which are reducible to an octahedron. From the analysis of Klaproth, it consists of copper 68.13, and phosphoric acid 30.95. It is found near the river Tamar in Cornwall, at Rheinbreitbach, and in Hungary.

*Arseniate of copper* (*arsenikkies*, Leonh.; *cuivre arseniaté*, Haüy) occurs of a variety of forms, of which we add an enumeration, viz.—

I. Octahedral ..	bluish-white ..	..	..	translucent.
II. Rhomboidal ..	green ..	..	..	opaque, except when small.
III. Trihedral ..	bluish-black ..	..	..	opaque.
IV. Prismatic ..	brownish or yellowish-green			translucent.

The two first varieties are not so hard as fluor; the two last, however, are harder. The composition of the varieties differs but little—in general, copper, arsenic acid, and water—the first composing one-half, and the second one-fifth per cent., enter into the composition. They are all found in Cornwall, principally in the Huel Unity and Tincroft mines.

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The ores of copper can always be distinguished from those of iron, by the blue colour they afford when immersed into liquid ammonia.

A very important class of metallic bodies next comes under our inspection, containing several very interesting combinations and crystallized specimens of metals. As a metal, iron cannot be too highly esteemed, nor its value fully appreciated, as it not only enters into the composition of almost every substance, but it

forms the principal article in the manufactures, and consequently in commerce. England knows how to appreciate its value better than any other nation, for, in the manufacturing districts, the increase of power and the superiority of workmanship are merely the results of the successful application of steam-power to machinery, and these are all of iron. Iron is magnetic, and it acquires this property when it is merely placed in a vertical position for some hours, the northern pole being always at the lower extremity. The ores of iron are numerous, as will hereafter be seen. It is found in combination with oxygen, sulphur, the phosphoric, muriatic, carbonic, and sulphuric acids, siliceous, alumina, and water, and when pure has a specific gravity of 7.8.

It seems from general accounts and actual remarks, that the different ores of iron belong to different tracts of country, or different formations; as, for example, the oxides and carbonates, or brown iron ores, belong to primitive tracts, the red iron to secondary districts, and those in which alumina enters into the composition, to carboniferous tracts of country, either resting upon the coal or forming layers in the clay-slate between the beds. Iron is very tenacious and malleable, and more ductile than gold and silver. It occurs in nearly a pure state, though this is rarely the case, and it is then reported to have fallen from the atmosphere. In this state it is of a steel-grey colour, and is composed of iron and a small portion of nickel. It is a very rare mineral, occurring generally in the warmer countries, only one instance being known of its being found in England; it is, however, reported to have been found in Ireland. A mass, weighing 3,000 lbs., was formed near the Red River, in Louisiana, and a large mass is preserved as a corner-stone in one of the towns of Northern Mexico. It has been found in several localities in South America and Siberia.

*Sulphuret of iron* (*schwefelkies*, Leonh.; *iron pyrites*,\* Phill.; *fer sulphuré*, Brong.) is the most abundant mineral of the class, being the one from which the iron of commerce is in a great degree extracted; but if not carefully smelted, it is likely to be brittle, and consequently of less value. It occurs in rounded masses, and crystallized in the form of the cube or octahedron, and modifications of them. It likewise occurs as a coating to other substances. Its colour is brass-yellow, sometimes brownish, owing to decomposition, as the sulphur is readily disengaged in a short space of time, particularly in the rounded masses, and the mass then falls to pieces. That from the Alps, which is the matrix of the gold, contains so much sulphur that it destroys the paper upon which it is placed. From the analysis of a specimen from Bognor, it is constituted of iron 45, and sulphur 55; but this varies according to circumstances. It contains fre-

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\* Pyrites is derived from the Greek, in allusion to its giving sparks when struck.



quently a proportion of arsenic, which causes the colour to be more of a grey, or a portion of gold, then it assumes a deep yellow colour. In this class the gold pyrites of the Alps is placed. It has been conjectured that the rounded masses are of atmospheric origin, on account of their form and the quantity in which they are found. At one time a mass of chalk, which had been thrown out into spoil, after forming an embankment on the London and Birmingham Railway, was found covered the next morning with small masses of sulphuret of iron, agreeing precisely in the description with this class, and which had no doubt fallen during the preceding night. It is also singular that these masses are found in or near the chalk districts only.

*Aluminate of iron* (*strahlkies*, Leonh. ; *fer sulphuré blanc*, Haüy ; *white iron pyrites*, Phillips) is of a metallic tin-white colour, sometimes slightly tinged with yellow. It occurs botryoidal, stalactitic, and crystallized. It derives its name from the small proportion of alumina it contains, but which rarely exceeds 3 per cent. ; on analyzing a specimen with care, I have detected 3 per cent. of alumina, 48 of iron, 49 sulphur ; and the form of the crystal, which deviates but slightly from the varieties of sulphuret of iron, may be attributed to this addition. It occurs plentifully in Cornwall.

*Magnetic sulphuret of iron* (*magneteisen*, Leonh. ; *fer sulphuré ferrifère*, Haüy) occurs massive, and crystallized in six-sided prisms, of which the lateral angles are replaced by planes. It is found of yellowish-white, reddish, or brownish colour, at Moel Elion in Caernarvonshire, in Norway, the Hartz mountains, and Silesia. When pure, it is magnetic. A second variety has received a different appellation (*magnetic iron ore*, Phillips ; *magneteisenstein*, Leonh.) on account of the much smaller proportion of iron it contains. It occurs crystallized in octahedrons, which is the primary form, and of a metallic, shining black colour. It also occurs massive (*loadstone*), but not so frequently. It is a plentiful associate of iron pyrites in schistous rock, and is plentiful in primitive rocks. In Cornwall it is associated with other ores of iron, and is frequent in the schistous formation of Mexico.

*Oxide of iron* (*oxydeisen*, Leonh.) occurs massive, of various shades of red, of an earthy appearance and texture, and yields a somewhat clayey odour when breathed upon. It is constituted of iron and oxygen, in the proportion of 13 of the former, to 38 of the latter. It is found plentifully in Wales, Cornwall, Bohemia, and Siberia, associating the ores of iron and copper, and not less frequently accompanied by quartz.

*Oligistic iron* (*eisenglanz*, Leonh. ; *fer oligiste*, Brong.) differs from the magnetic sulphuret of iron by its not possessing the magnetic power. It occurs lamelliform, and rarely crystallized. It is of a shining iron-black colour, brilliant, and often irride-



scent. It is most plentiful in Elba ; less so in Bohemia, Bavaria, and Saxony, and uncommon in North America. From the analysis of Hassenfratz, it is composed of 69 iron, and 31 oxygen.

*Hydrate of iron* (*rothereisenstein*, Werner ; *red iron ore*, Phillips) is likewise known by the name of *hematite*, and occurs fibrous, massive, and scaly, of a red colour, varying in intensity. Some varieties occur of a grey colour ; specific gravity 4·7. It is well calculated for the manufacture of iron, and occurs in primitive rocks in Devonshire, Cumberland, Bohemia, Saxony, and Silesia.

*Hydrosilicate of iron* (*brauneisenstein*, Leonh. ; *fer oxydé*, Haüy ; *brown iron ore*, Phillips) occurs of various shades of brown, and crystallized, also in botryoidal and stalactitic masses. From the analysis of Vauquelin, it has been ascertained to consist of iron 80·25, water 15, silex 3·75, on which account I have named it hydrosilicate of iron. It occurs in secondary rocks, principally in Saxony and Bohemia, also in the Tincroft mine in Cornwall. It affords a very good iron for the steel manufacture, on account of the absence of any acid.

*Silicate of iron* (*jaspisartiger eisenstein*, Leonh. ; *jaspersy iron*, Phillips) occurs of a yellowish or reddish-brown colour, and massive. It occurs at Neustadt, in Austria, in limestone, and in Shropshire. It is very hard.

*Carbonate of iron* (*spathose iron*, Jamieson and Phillips ; *fer spathique*, Brong. ; *spatheisen*, Leonh.) occurs of various shades of yellow, passing into light brown, with a lamellar structure, and shining. The analysis of a specimen from Cornwall yielded, iron 62, carbonic acid 37, magnesia 1. It differs from brown spar in composition and colour, and from hydrosilicate of iron in composition likewise. It occurs in several of the Cornish mines, but not plentifully ; in the Hartz, and North and South America.

*Phosphate of iron* (*blue iron ore*, Phillips) occurs of a bluish-green or blue colour, of an earthy appearance, and crystallized in right oblique-angled prisms. It contains about 30 per cent. of water. It occurs with iron pyrites in the neighbourhood of St. Agnes in Cornwall, and in Bohemia. A second variety, which partakes still more of the earthy appearance of the foregoing species, is found in the peat bogs of the different parts of this country ; it is, however, distinguishable on account of its grey colour, which on exposure becomes blue.

*Sulphate of iron* (*green iron*, Phillips ; *eisenvitriol*, Leonh.) occurs of various shades of green, yellow, and yellowish-green. These latter colours are, however, the result of exposure, the natural colour being a bright emerald-green. It occurs principally massive, but is also found crystallized in right oblique-angled prisms. It is an associate of the different ores of iron,

and occurs with them, and in the coal-mines of northern England. It arises from the gradual decomposition of iron pyrites, which I have mentioned in that article.

*Chromate of iron* (*chromeisenstein*, Leonh. ; *fer chromaté*, Brong.) occurs of a black or yellowish-black colour, rarely yellow. It is found massive and crystallized, in octahedrons ; also disseminated. It occurs in serpentine rocks in the United States of America, and also in Cornwall. It is employed as a pigment, and produces a fine yellow colour.

*Arseniate of iron* (*wurfelerz*, Leonh. ; *cube ore*, Jamieson ; *fer arseniaté*, Haüy) occurs of various shades of green, reddish-brown, and brownish-yellow. It occurs principally in cubes, seldomer massive, with a vitreous lustre. It is sometimes transparent, though not unfrequently opaque. From analysis, it has been ascertained to consist of iron 48, arsenic acid 18, water of crystallization 32, carbonate of lime 2.50. It becomes electric when exposed to heat. It occurs in the Wheal Unity mines ; also in the department of Haute Vienne, in France.

*Oxalate of iron* (*Humboldtine*) has only recently been discovered ; but from all accounts it appears to be of a bright yellow colour, and occurs in indeterminate crystals, with a specific gravity of 1.3. The analysis of Mariano de Rivero determines its composition to be iron 54.56, oxalic acid 46.14. It occurs near Bilin, in Bohemia, and also at Kolowserien.

MANGANESE, the metal next in succession, has rarely been reduced to the metallic state, on account of the readiness with which it is decomposed on exposure to the atmosphere. It is employed in the glass manufacture, for producing a violet colour, and is used, when in a state of black oxide, to produce oxygen gas. It is found principally in primitive countries, but is also present in secondary formations. Specific gravity 8.

*Silicate of manganese* (*siliferous oxyde*, Jamieson ; *manganèse oxydé silicifère*, Haüy) occurs of a pale red colour, sometimes yellowish, inclining to black. It occurs massive, rarely crystallized in curvilinear rhomboids. From different analyses, which have yielded nearly the same results, it is determined that its composition is nearly in the following proportions ; viz. manganese 49, silice 49, lime 4, magnesia 1.6. It melts into a pale red glass before the blowpipe, without addition. Its specific gravity is 3.2. It occurs near Tavistock in Devonshire, and in Cornwall. On the continent at Laughaushylta in Sweden, in Siberia, and Transylvania.

*Oxide of manganese* (*grau braunsteinerz*, Werner ; *manganèse oxydé*, Brong.) occurs of a steel-grey colour, crystallized in prisms, the primary form of which is a right rhombic prism. It is soft, and very brittle. There is also a compact variety, which bears the name of *wad*, when possessing an earthy appearance. It occurs plentifully in iron-mines, and is likewise found near Cal-

lington in Cornwall, near Bristol, and at Aberdeen. The earthy variety is an ingredient in the peat of the morass, near Capper, in Ireland.

*Sulphuret of manganese* is of a brownish-black colour, and occurs botryoidal and massive. Its composition is, manganese 82, sulphur 11, and carbonic acid 5. It is found in Cornwall and Transylvania.

*Carbonate of manganese* (*manganèse oxydé carbonatée*, Haüy) occurs massive, and of a grey colour, more commonly, however, rose-red. It occurs in Bohemia.

*Carboni-silicate of manganese* (*hornmangan*, Leonh.) is a mineral of which but little is comparatively known. The following is the description of a specimen which some time since was brought under our notice. It occurs massive, in globular efflorescences or druses, varying in size, forming the surface of silicate of manganese and brown iron ore. It is somewhat brittle, and of a dark brownish-grey colour, approaching steel-grey. From analysis, it consists of manganese 54, siliceous 32, carbonic acid 8·2, and water 3·4. It occurs at Stahlberg, with jaspery iron ore.

*Allagite* contains the same constituents, and a trace of lime; it occurs in the Harz.

*Rhodonite* contains a portion of alumina, and the photogite contains a larger per-centage of carbonic acid than the preceding minerals.

ARSENIC rarely occurs in the metallic state in nature, but the metal is of a bluish-white colour, and of a metallic brilliancy. It is a very plentiful constituent in almost every variety of metallic production, and constitutes a class of ores in itself. It occurs in primitive countries, and its specific gravity is 8·31. Its poisonous qualities are well known, and need no further remark. It is plentiful in most primitive rocks, and can always be detected, by the offensive odour which it yields when exposed to heat.

*Sulphuret of arsenic* (*realgar*, Phillips; *realger*, Leonh.) occurs of a beautiful red (*realgar*) or yellow colour (*orpiment*), both varieties occurring crystallized, massive, disseminated, acicular, and investing; but it is by no means abundant in any one of these forms. The crystals are prismatic, and are either translucent or slightly transparent, becoming electric by rubbing. The results of two analyses by Klaproth are as under:—

	Realgar.				Orpiment.			
Arsenic	69·0	..	..	..	..	62·0		
Sulphur	31·0	..	..	..	..	38·0		
	<hr/>				<hr/>			
	100·0				100·0			

The specific gravity of both being 3·3 to 3·4. It occurs in pri-



mitive rocks in the province of Dauphiné in France, in Galicia and Transylvania, at Andreasberg in the Harz, and in Mexico and China, and generally associated (viz. realgar and orpiment).

*Oxide of arsenic* (*arsenicbloom*, Jamieson ; *arsenikblueth*, Leonh. ; *arsenic oxydé*, Haüy) occurs of a snow-white colour, with a slight tinge of yellow, red, or grey, generally of an earthy appearance, though it likewise occurs capillary and investing. It accompanies the red sulphuret of arsenic at Andreasberg, at Joachimsthale, and in the province of Dauphiné.

*Native arsenic* (*gediegen arsenik*, Leonh. ; *arsenic natif*, Haüy), though so called, differs materially from other native metals, on account of the numerous foreign ingredients it contains, among which may be enumerated, copper, silver, gold, and iron. It is of a greyish-black colour, brilliant when first broken, but when exposed to the air it becomes dull ; it occurs massive, botryoidal, and sometimes nearly fibrous. It occurs in the province of Alsace in France, at Königsberg in Norway, and at numerous other parts of Germany and the American continent.

BISMUTH is of a reddish-white colour, very brittle, and easily fusible—(from experiments made by Sir Isaac Newton, an alloy of 8 parts of bismuth, 5 of lead, and 3 of tin, melts in water below the boiling point). It is found pure, and also with sulphur. It is used in several soft solders ; specific gravity 9.8.

*Gediegen wismuth*, Leonh. ; *bismuth natif*, Haüy.—It has generally a slight external tarnish, and it occurs principally amorphous, with a lamellar structure. Before the blowpipe it volatilizes in the form of a white vapour, with an arsenical odour. It occurs in primitive districts of country, associated with cobalt, nickel, silver, and lead ; at Johangeorgenstadt in Saxony, in France, Transylvania, Norway, and Cornwall.

*Sulphuret of bismuth* (*wismuthglanz*, Leonh. ; *bismuth sulphuré*, Haüy) occurs of a lead-grey colour ; crystallized in prisms deeply striated longitudinally, and in small masses. Its specific gravity is 6.1. It occurs at Joachimsthale and Georgenstadt with native bismuth, cobalt, and arsenic. It frequently contains copper (*cupriferous sulphuret of bismuth* ; vide Phillips, p. 274), when the metal becomes tarnished of a red colour. The analysis of Klaproth determined the composition to be, bismuth 47.24, copper 34.66, and sulphur 12.58. It likewise occurs in combination with lead (*plumbo-cupriferous sulphuret of bismuth* ; vide Phillips, p. 274), of a steel-grey colour, with a yellowish tarnish. The annexed is the analysis of John : bismuth 43.2, lead 24.3, copper 12.1, nickel 1.5, tellurium 1.3, and sulphur 11.5. The only known locality is near Beresof, in Catharinenberg, in Siberia.

*Carbonate of bismuth* is a rare, and as yet but imperfectly-known mineral. It occurs of a yellowish or whitish colour, somewhat earthy in appearance, but harder than carbonate of lime. It occurs in Cornwall, at St. Agnes and St. Columb.



ANTIMONY is found in primitive and secondary districts, of a silvery-white colour, brittle, and of a specific gravity of 6·5. It is employed in medicine, and in the composition of printing-types.

*Native antimony* (*gediegenspies-glas*, Leonh. ; *antimoine natif*, Brong.) is of a tin-white colour, which becomes tarnished by exposure. It occurs amorphous, with a lamellar structure, easily frangible, and containing 97 per cent. of antimony, and the remainder a mixture of silver and sulphur. It occurs in Dauphiné, in the Harz, and at Sahlberg, in Sweden.

*Sulphuret of antimony* (*grey antimony*, Phillips ; *grau spiesglaserz*, Leonh. ; *antimoine sulphuré*, Haüy) occurs of a light metallic grey colour, massive, and crystallized in rhombic prisms, which are laterally aggregated. A fine variety is found on the north coast of Cornwall, near St. Agnes, very compact, and closely radiated. It likewise occurs in Auvergne, the Harz mountains, and in Hungary. A very beautiful variety, from Huel Boys mine, in Cornwall, has received the name of *plumose sulphuret of antimony*, on account of its downy appearance. It occurs investing the surface of other metals and minerals. Another variety is known by the name of *red antimony* (*antimoine oxydé sulphuré*, Haüy) ; it is slightly translucent, and very brittle, and is composed of antimony 67·5, oxygen 10·8, sulphur 19·7. It occurs, with all the other varieties, at Allemont, in France.

*Oxide of antimony* (*weiss spies-glaserz*, Leonh. ; *antimoine oxydé*, Haüy) occurs of a greyish-white or yellowish-white colour, in tabular crystals, but more commonly massive. It is translucent, soft, and heavy, with a shining lustre. It accompanies the other ores of antimony at all the localities where they are found, and at Malazka, in Hungary, in clay containing sulphuret of antimony.

*Earthy oxide of antimony* (*antimonial ochre*, Phillips) occurs of various shades of yellow and brown ; it occurs investing the ores of antimony, and is brittle and earthy in appearance. It is found in Cornwall with the ores of antimony.

MOLYBDENA has never been found pure, and is difficultly reducible to the metallic state, when it is of a greyish-white colour. It is a rare mineral ; its specific gravity is 8·6.

*Sulphuret of molybdena* (*wasserblei*, Werner ; *molybdaen*, Leonh.) is of a bright lead-colour, and it occurs massive, and in flat hexahedral tables, opaque, and slightly flexible. It consists of molybdena 60, and sulphur 40. It is soluble with violent effervescence in carbonate of soda. It occurs in Cornwall, at Calstock, in Huel Unity, and Huel Gorland ; also in Westmoreland, and in Glenelg, in Inverness-shire.

*Oxide of molybdena* (*molybdaenocker*, Leonh.) occurs of various shades of yellow. It is imperfectly known, and, on account of its rarity, has only been described by Berzelius :—" Its charac-

ters resemble those of pure molybdic acid, but, treated with soda, it sinks into the charcoal, leaving a residuum of protoxide of iron on the surface. It occurs with the sulphuret of molybdena at Nummedalen in Norway, and at Loch Creran in Scotland.”—(*Vide* Phillips, p. 249.)

TELLURIUM is likewise an exceedingly rare metal, about the colour of tin, nearly as fusible as lead, and with a specific gravity of 6·2.

*Native tellurium* (*gediegen tellur*, Leonh.; *gediegegen sylvan*, Werner; *teller natif auro ferrefere*, Haüy) is of a tin-white colour, passing into metallic-grey. It occurs in minute crystals, the primary form of which is unknown. Analysis: tellurium 92·55, iron 7·2, gold 0·25. It burns with a green flame, on exposure to a great heat, and is almost entirely volatilized in a white vapour with a pungent acrid odour. It has only been found in Facebay in Transylvania. Another variety, containing the same ingredients, has received the name of *graphic tellurium*. It consists of tellurium 60, gold 30, silver 10. It has only been found at Offenbaya in Transylvania. A third variety, in which lead enters into the composition (*plumbo-auriferous-tellurium*, *yellow tellurium*, Phillips), is found at Nagyaj in Transylvania, which, on analysis, yielded tellurium 44·75, gold 26·75, lead 19·5, silver 8·5, sulphur 0·5.—*Klaproth*. There is also another variety, which contains above 50 per cent. of lead, duller in colour, whence it is called *black tellurium*. Upon analysis it was ascertained to be composed of tellurium 32·2, lead 54, gold 9, silver 0·5, copper 1·3, sulphur 3. It is likewise found at Nagyaj in Transylvania.

TIN has never been found pure. It is the lightest of the ductile metals, is of a whitish colour, more tenacious than lead, very fusible and elastic.

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Some years since, several pieces of pure tin were found in different localities, which gave rise to an opinion that tin occurs in the native state; but from authenticated sources of information, this erroneous supposition has been dropped, as the places where the specimens were found were the sites of some old smelting-houses.

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*Oxide of tin* (*zinnstein*, Leonh.; *étain oxydé*, Haüy; *tinstone*, Jamieson) occurs nearly colourless, or of a reddish-brown colour, and in both cases it is nearly transparent. It rarely occurs massive; generally, however, crystallized in the crevices of veins. The primitive form of the crystal is the obtuse octohedron, but the natural crystals are prismatic (the planes of the prism arising from the replacement of the later solid angles of the primary octohedron by six-sided planes). It gives sparks with the steel, and decrepitates strongly before the blowpipe. It belongs exclusively to the oldest primitive rocks, and is found in veins

and beds associated with quartz, mica, steatite, topaz, phosphate of lime, pyrites, &c. It is principally found in Cornwall, where it is worked to advantage, and has been a source of considerable benefit to this country in general for several centuries. It likewise occurs in the Erzgebirge, in different parts of France, in Sumatra, and Greenland. The fibrous variety (*wood tin*) appears to have arisen from the partial destruction of this variety. It occurs in most of the stream-works in Cornwall.

*Granular tin* is a third variety, found in loose globular masses, sometimes imbedded in the gangue or walls of the vein, and at other times loose in the sand of rivers, in pieces varying in size from a grain to the size of the fist. It is found in Cornwall in this state, also in Chili and Mexico, and is frequently accompanied by grains of gold.

*Sulphuret of tin* (*tin pyrites*, Phillips; *zinnkies*, Leonh.) occurs of a steel-grey colour, and sometimes also yellowish-white or yellow. It has sometimes been called bell-metal ore, on account of its resemblance in colour to that metal. It consists of 26·5 tin, 30 copper, 12 iron, and 30·5 sulphur. It has only been found in Cornwall, in the parish of St. Agnes.

TUNGSTEN is a hard metal, of a light steel-grey colour, possessing a specific gravity of 17·22. It has not been found in the pure state, but only in the state of an acid combined with iron (*wolfram*), or with lime (*tungsten*). Tungstic acid consists of 80 tungsten, 20 oxygen.—(*Vide* Gmelin's *Chemie*.)

*Oxide of tungsten*.—Imperfectly known, and described only in "Silliman's Journal," October, 1821. Colour—orange to chrome-yellow or yellowish-grey. Appearance—massive, with some appearance of regular form. Specific gravity 6. Tests—unalterable before the blowpipe—insoluble in acids—soluble in warm liquid ammonia, and is precipitated white by acids; the precipitate, by standing, again assumes the yellow colour. It occurs in Baltimore, in North America.

*Tungstate of iron* (*wolfram*) occurs of a brownish-black or brown colour, massive and crystallized. The structure is lamellar. It contains a small proportion of manganese. It occurs only in primitive rocks in Saxony and Bohemia.

*Tungstate of lime* (*tungsten*) is of a greyish or yellowish-white colour, translucent, occurring crystallized and massive. It becomes opaque before the blowpipe, but does not melt. It occurs in primitive rocks in Cornwall, Sweden, Saxony, and Bohemia.

TITANIUM has rarely been reduced to the metallic state, on account of the extreme difficulty which attends its reduction; but when completed, the metal is of a copper-red colour. It occurs in a variety of forms, but its only use is the production of a rich brown colour for the purpose of painting porcelain, which has, however, fallen into disuse on account of the want of uniformity. Its specific gravity is about 4·0.



*Oxide of titanium* comprises several varieties of this class, as under, agreeing in composition, but differing in outward appearances and specific gravity. The two varieties are Anatase and Titanite.

*Anatase* (*octædrit*, Werner; *anatas*, Leonh.; *titâne anatase*, Haüy; *octohedrite*, Jamieson) occurs of a greenish-grey or reddish-brown colour, crystallized in the form of an octohedron with equal faces, with lamellar structure, and splendid lustre. It is generally semi-transparent, and frequently opaque. Its specific gravity is 3·8. It is a rare mineral, found principally near Oisans in Dauphiné, in Norway, and it is reported as having occurred in Cornwall.

*Titanite* (*rutil*, Leonh.; *titane oxydé*, Haüy) occurs of a reddish-brown colour, crystallized in prisms which are opaque, with a specific gravity of 4·4. It occurs with quartz, at Cairnghorm and Bengloe in Scotland, near Snowden and Bedgellart in Wales, near St. Austell in Cornwall, on the continent in the quartz of Mount St. Gothard, at Oisans in Dauphiné, and also in Bohemia, Norway, and Hungary. It is generally found disseminated in slender crystals in transparent quartz, also forming slender crystals between prisms of quartz, of which I have seen beautiful specimens from the Alps.

*Iserine* (*iserin*, Leonh.) occurs of a black colour, passing into a dark brown. It occurs granular, sometimes strongly magnetic, with a semi-metallic lustre. It occurs in the sand of the small river Iser in Siberia (whence its name), and also in the Riesengebirge; Dr. Traill found it in the sand of the Mersey near Liverpool. There are also other varieties of the preceding species, viz.:—

*Nigrine*, of a brownish-black colour, occurring in small angular masses, with lamellar structure, and externally shining. It is not magnetic. It occurs in primitive rocks in Transylvania, associated with hyacinth in Ceylon, and in the Uralian mountains.

*Menaccanite* (*menaccan*, Leonh.) occurs of a greyish or blackish colour, in small grains, with a glistening lustre. It is slightly magnetic, and very brittle. It was originally found near Menaccan in Cornwall, and is now found at several other places in that county.

*Silicate of titanium* (*crichtonite*) occurs in small rhomboidal prisms, perfectly black, opaque, and shining. It is principally found with anatase in Dauphiné.

**SPHENE, OR SILICO-CALCITE OF TITANIUM** (*sphen*, Leonh.), occurs of a greyish, reddish, or yellowish-black colour, generally amorphous, and sometimes in small rhombic prisms, slightly translucent on the edges. It occurs near Ben Nevis in Scotland, and in the Shetland islands; on the continent it is found in the department of Puy de Dôme, in volcanic rock; and in Norway and Sweden, in granite.

CERIUM has recently been added to the list of metallic ele-



ments, by Vauquelin, who succeeded in reducing it to the metallic state. It is harder and more brilliant than pure cast-iron. The specific gravity varies from 4·2 to 4·9.

*Silico-oxide of cerium* (*cerite*, Jamieson and Phillips) occurs of a rose-red colour, approaching brown, massive or disseminated, opaque, and difficultly frangible. Analysis of Vauquelin:—

Oxide of cerium .. .. .	67·0
Silex .. .. .	17·0
Oxide of iron .. .. .	2·0
Lime .. .. .	2·0
Water and carbonic acid .. .. .	12·0
—100·0	

It is found in the primitive rock of the neighbourhood of Riddarhytta in Sweden, associated with bismuth and lead.

*Allanite* (*cerium oxydè silicifère noire*, Lucas) is a rare mineral, occurring of a brownish-black colour, in prismatic crystals, with a semi-metallic appearance. It is opaque, whence it is easily distinguished from yttrite (gadolinite), and also by its colour. It was discovered in West Greenland, by Professor Giesecké, but derives its name from Mr. Allan, who first described it.

*Orthite* can be distinguished from the preceding varieties on account of its being found in seams (in felspathic rock), and not granular or crystallized. Analysis of Berzelius:—

Cerium .. .. .	19·50
Protoxide of iron .. .. .	12·44
„ manganese .. .. .	3·44
Yttria .. .. .	3·44
Silex .. .. .	32·00
Alumina .. .. .	14·80
Lime .. .. .	7·84
Water .. .. .	5·36

It occurs in the neighbourhood of Fahlun in Sweden.

YTTRO-CERITE varies in colour from grey to red and violet. It is found in amorphous masses, investing other minerals, and opaque. Its specific gravity is 3·447. It occurs with the preceding variety at Fahlun, in the mine of Finbo.

\* \* \* \* \*

Cerium likewise occurs in combination with the fluoric acid, in various proportions; also with yttria. The colour is generally yellow, but in some cases also red. The analyses which have already been made have not been satisfactory, and the composition cannot, on that account, be correctly asserted.

URANIUM is a brittle metal, of a reddish-brown colour, but has never been observed in the metallic state. Specific gravity, 6.

*Phosphate of uranium* (*uranglimmer*, Leonh.; *uranite*, Phillips) occurs generally of an emerald-green colour, but not unfrequently also of shades of yellow and yellowish-brown. It is a singular fact, also, that these two different shades of colour

are often met with in the same specimen, or even in the same crystal. It is slightly translucent, verging on transparent, but generally opaque. It occurs in thin lamellar plates, and crystallized (the primary form is the right rhombic prism). It occurs near St. Agnes in Cornwall, also in several other mines in that county, on primitive rock; near Limoges in France, and Baltimore in Maryland. It effervesces in nitric acid.

*Oxide of uranium* (*uran-ochre*, Phillips.; *pecherz*, Leonh.) occurs of a grey or blackish colour, in globular masses, massive and disseminated, also pulverulent. It has a vitreous appearance, and is slightly translucent on the edges. It occurs in the Tincroft mine with uranite.

COLUMBIUM is one of the late discoveries in metallurgy, and was formerly considered as a different metal from *tantalum*, which, however, has been proved by Dr. Wollaston to be the same. It has only lately been reduced to the metallic state, when it assumes a dark grey colour. Specific gravity, 6.0. It occurs in combination with oxygen in the mineral known by the name of *columbite* (*tantalite*, Jamieson), the colour of which is bluish-black; and it occurs in small flat quadrangular prisms, striated longitudinally; also in crystalline masses. The analysis of a specimen by Wollaston yielded oxide of columbium 80, oxide of iron 15, oxide of manganese 5. It occurs at Bodenmais in Bavaria, and in Connecticut in North America; it likewise occurs in combination with yttria (*yttrrotantalite*), of an iron-black colour, occurring in small angular pieces. Specific gravity, 5.1. The constituent parts are oxide of columbium 45, and yttria 55. It is found associated with yttrite at Ytterby in Sweden, and at Riekerlamsan in Greenland.

CHROME is a brittle metal, of a greyish-white colour, and 5.9 times heavier than water. It is only found in the state of an oxide or an acid, when it forms a constituent in the ruby. It is used for producing a green colour in the porcelain manufacture.

*Oxide of chrome* occurs of a bright green colour, either pulverulent or crystalline compact. It occurs in the island of Uist, one of the Shetland group, also in Burgundy. The green colour is changed to yellow by heating, and it is soluble by boiling in the alkalies, imparting to them a green colour, which disappears upon continuance of the heat, and the oxide is precipitated.

COBALT occurs in a variety of forms in nature, though not in the native state. It is of a grey colour, possessing considerable magnetic properties. Specific gravity, 7.7. It occurs in both primitive and secondary mountains, and is employed for producing a fine blue colour in the glass and porcelain manufactures.

*Arsenate of cobalt* (*bright white cobalt*, Phillips) occurs of a yellowish-white colour, crystallized in the form of the cube, and the modifications of that figure. It occurs in the primitive rocks

in Norway, Silesia, and Sweden. Analysis: cobalt 44, arsenic 55, and sulphur 0·50.

*Grey cobalt* contains an additional portion of sulphur, and is of a greyish-black colour externally. It is found in amorphous masses, but never crystallized. The analysis of Stromeyer determines it to be composed of cobalt 33·10, arsenic 43·47, iron 3·02, sulphur 20·08, water 1·33. It occurs near Dolcoath in Cornwall, and in Bohemia, Saxony, Silesia, France, and Hungary. A second variety occurs botryoidal, and crystallized in cubes and octohedrons, possessing a tin-white colour. It contains cobalt 20·31, arsenic 74·21, iron 3·42, and copper 0·15. It occurs in Saxony and Bohemia.

*Oxide of cobalt (bloom of cobalt, Phillips)* occurs of a rose-red colour, and sometimes greyish or brownish-grey. It occurs investing and in botryoidal masses, and also in acicular prisms; it is soft. Analysis of a specimen from Dauphiné: cobalt 30, arsenic 22, oxygen 11, and water 27. It occurs in Cornwall in the Botallack mine, near Land's End, near Edinburgh, and in Dauphiné, Hungary, and Saxony.

*Sulphuret of cobalt (cobalt sulphuré, Lucas)* occurs of a yellowish or greyish colour, massive and botryoidal. It fuses on charcoal before the blowpipe, yielding sulphurous odours. It occurs near Bastudes in Sweden.

*Sulphate of cobalt (red vitriol, Phillips)* occurs of a rose-red colour, stalactitic, or investing other minerals. Analysis of a specimen by Koppen: cobalt 38·71, sulphuric acid 19·74, and water 41·55. It occurs in the Tyrol and Suabia.

NICKEL occurs of a tin-white colour, is attractable by the magnet, ductile and malleable, difficultly fusible, and nine times heavier than water.

*Native nickel (gediegen nickel, Leonh.; haarkies, Werner; nickel natif, Haüy)* occurs in filaments of a yellowish or brownish-grey colour, flexible, but not magnetic. It contains a small portion of arsenic. It occurs near St. Austell in Cornwall, in Saxony, and Bohemia.

*Arsenical nickel (copper nickel, Jamieson; kupfer nickel, Leonh.)* occurs of a reddish or yellowish-red colour, which tarnishes on exposure. It occurs massive, botryoidal, and dendritic, somewhat brittle and shining. Analysis: nickel 44·2, arsenic 54·7, with a slight portion of iron and sulphur. It occurs in primitive rocks in Cornwall, Saxony, Bohemia, France, and the United States.

*Arseniate of nickel (nickel ocker, Leonh.)* accompanies arsenical nickel, is of an apple-green colour, forming a coating to that mineral. It is soluble in acids, and has most probably originated from the spontaneous decomposition of arsenical nickel. The localities are the same.

LEAD occurs of a bluish-grey colour, and is malleable, ductile,



and soft, with a specific gravity of 11.3. It is used in a variety of ways, too numerous to notice, the most useful being in medicine, in the formation of several alloys, and printing-types.

I. *Sulphuret of lead* (*galena*, Phillips) occurs of a lead-grey colour, massive, and of lamellar structure; also crystallized in the form of the cube and regular octohedron. It possesses a brilliant metallic lustre, and is very brittle. Analysis of a specimen from Wales: lead 78, sulphur 21. It decrepitates before the blowpipe, emitting a sulphurous odour, and finally melts into a metallic globule. It occurs in primitive and secondary mountains in beds, associated with iron, copper, zinc, and silver; the principal localities being Durham, Wales, Cornwall, the Vosges in France, the Saxon Erzgebirge, and North America. Phillips notices the several varieties separately, and enumerates *granular*, *compact*, *specular*, *antimoniferous*, *argentiferous*, and *super-sulphuret*, as varieties. The metal is procured by pounding and roasting the ore, in order to drive off the arsenical and sulphurous vapours. The annual produce of Great Britain is 50,000 tons.

II. *Blue lead* (*blaubleierz*, Leonh.; *plombleu*, Brong.) is a variety of sulphuret of lead. It occurs of a lead-grey or indigo-blue colour, massive, in six-sided prisms, and is rough and dull. Specific gravity, 5.4. It occurs in Cornwall, and at Zschoppau in Saxony.

III. *Bournonite* (*schwarz spiesglaserz*, Werner) is of a steel-grey colour, with a shining lustre. It occurs crystallized in rectangular prisms, possessing a lamellar structure. It possesses the same property of decrepitating before the blowpipe as the common sulphuret. It occurs in the parish of Endellione in Cornwall.

*Oxide of lead* (*native minium*, Smithson) occurs of a scarlet colour, amorphous, and rarely pulverulent. It is supposed to arise from the decomposition of galena. It occurs at Badenweiler, and in Siberia.

*Carbonate of lead* (*weiss bleierz*, Leonh.; *plomb blanc*, Brong.) occurs of a yellowish or whitish-yellow colour, in tabular crystals, and in prisms striated longitudinally, and closely aggregated, also massive. It possesses the property of double refraction. Specific gravity, 6.72. It effervesces in muriatic acid. It occurs in several mines in Durham, Wales, Cornwall, and in Saxony, Bohemia, Silesia, and Hungary. It occurs with a slight proportion of copper in some localities.

*Muriate of lead* (*murio-carbonate of lead*, Phillips; *hornblei*, Werner; *plomb muriaté*, Brong.) occurs of a greyish colour, passing into yellow, and crystallized in four-sided rectangular prisms. It is transparent or translucent, soft, and easily frangible. Specific gravity, 6.0. It occurs in Germany, near Badenweiler, and in the United States.



*Phosphate of lead* occurs of a green, yellowish-green, or yellow colour, crystallized in six-sided prisms, easily frangible, and transparent. Specific gravity, 6.4. It occurs in Cornwall, the Harz, Saxony, and Bohemia.

*Arseniate of lead* (*plomb arsenieté*) occurs of a pale yellow colour, passing into grass-green, translucent, rarely transparent, and easily frangible. Specific gravity, 5.6. It occurs in Cornwall, between Redruth and Truro.

*Sulphate of lead* occurs of a greyish-white colour, crystallized in rhombic prisms, with diedral summits, and transparent. It is brittle. Specific gravity, 6.3. It occurs near St. Ives in Cornwall, in the Parys mine in Anglesea, and in the Harz mountains.

*Molybdate of lead* (*gelbes bleierz*, Werner ; *plomb jaune*, Brong.) occurs of a yellow colour, and crystallized in acute octohedrons, translucent, and brittle. It rarely occurs massive. It occurs at Bleiberg in Carinthia, and in the Tyrol, Austria, and Transylvania.

*Chromate of lead* (*rothbleierz*, Werner ; *plomb rouge*, Brong.) occurs of an orange-red colour, crystallized and massive, translucent, rarely transparent, and brittle. It gives a green colour to borax before the blowpipe. It occurs in the gold-mine of Beresof in Siberia.

ZINC is of a bluish-grey colour, possessing a small degree of tenacity, is ductile, malleable, and seven times heavier than water. It is used in medicine, and for coins in China.

*Sulphuret of zinc* (*blende*, Phillips ; *blend*, Leonh. ; *blende*, Brong.) occurs of a brownish, yellowish, or reddish-brown colour, amorphous, and crystallized in a variety of forms, the primary being a rhombic dodecahedron. It occurs in primitive and secondary rocks in Cornwall, Scotland, Durham, Norway, and various parts of Germany.

*Oxide of zinc* occurs of various shades of red, massive, disseminated, and micaceous. It is translucent, brittle, and has a specific gravity of 6.2. It occurs in New Jersey in North America.

*Carbonate of zinc* (*calamin*, Leonh. ; *zinc carbonaté*, Haüy ; *calamine*, Phillips) occurs crystallized, compact, earthy, and pseudo-morphous ; the crystallized varieties of a green colour, and of the form of acute rhomboids. The latter varieties of a yellowish-brown colour. It occurs in beds in secondary limestone in Somersetshire, Derbyshire, and Durham.

The ores of zinc contain a new chemical metallic element, *cadmium*, which never occurs pure in nature. The presence of it in the carbonate of zinc can be detected by placing a small quantity, pounded, on a piece of platina foil, and by passing this over the blue flame of a candle, the cadmium will be reduced and deposited in the form of a reddish-brown protoxide on the platina.

## CLASS III.—INFLAMMABLE MINERALS.

Several of these substances are found in a liquid, others in a solid state, when they are easily broken. They are only about twice as heavy as water. Most of the metals, when altered by combustion, acquire an increase of weight, whereas this class are sensibly diminished in weight by the same process.

**CARBON** (*diamond*). The combustible properties of this rare mineral being fully known, it deserves the first place among this class. They are either colourless, or slightly tinged with yellow, blue, or yellowish-green. They are always found in crystals, varying in size and in form, and varying from transparent to nearly opaque. When heated, they become phosphorescent, and are the hardest of all substances. They burn at a heat inferior to the melting point of silver, and yield as much carbonic acid as charcoal, whence they appear to consist of pure carbon. The diamond region of India extends over a tract of country reaching from Bengal to Cape Comorin, the principal being at Golconda. Very fine diamonds have been found at Pastael, twenty miles from Golconda, among which may be enumerated the Pitt, or Regent Diamond. The diamond-mines of Brazil are situate due north of the river Janeiro, where they are found imbedded in the sandstone grit, of which the country is principally composed; also in the mud of the rivers. The largest diamond extant is in the possession of the Rajah of Mattan, in the island of Borneo; and nearly resembles an egg, with an indented hollow near the smaller end.

**COAL** comprehends a variety of carboniferous minerals, generally speaking, of great importance and mineralogical interest.

*Common coal* (*steinkohl*, Leonh.; *charbon de terre*—French) occurs massive only, of a shining black colour, generally splendid, though sometimes also dull. It occurs in secondary districts of country, particularly in the counties of Durham, Northumberland, Stafford, and Gloucester, in England; also in South Wales and in Flintshire; in Ireland; in Belgium in the environs of Liège, in France and Germany; and North America. It contains a great number of vegetable remains, particularly of those of the fern tribe; and in several instances whole trunks of trees, several feet in height, have been found imbedded in it.

*Anthracite coal* (*blind coal*, Phillips; *glanzkohle*, Leonh.; *anthracite*, Brong.) occurs massive, slaty, and columnar, of an iron-black colour, very splendid, and sometimes tarnished. Some varieties possess a very splendid variegated appearance. It occurs in the Staffordshire district, and also in South Wales. Anthracite is the most abundant coal of North America. It burns without either smell or flame, and on that account can be easily distinguished from common coal.

*Cannel coal* (*kennel kohle*, Leonh.; *houille*, Haüy) occurs massive, of a greyish-black colour, a resinous lustre, and flat conchoidal fracture. It decrepitates when burnt, but yields a bright flame. It occurs principally as the uppermost bed of the coal deposits in this country and Scotland, and is used in the place of candles in some places, whence its name.

*Jet* (*pechkohle*, Leonh.; *jayet*, Haüy) occurs of a dull black colour, resinous in lustre, and with a perfect conchoidal fracture. It occurs in masses similar to layers in the shale of the environs of Whitby, in Yorkshire, and is found at many places in France and Germany. It burns with a bituminous odour and greenish flame.

*Brown coal, or wood coal* (*braunkohle*, Leonh.; *lignite*, Werner) occurs of various shades of brown, sometimes earthy, but more commonly fibrous. It burns with a weak flame and strong odour, resembling that of peat, when burnt. It yields readily to the knife. It occurs near Bovey, in Devonshire, whence it has received the name of Bovey coal; also in Thuringia, France, Bavaria, Saxony, and Silesia.

BITUMEN occurs in three varieties, viz.—

1. *Earthy bitumen* (*erdiges erdpech*, Leonh.; *bitume glutineuse*, Haüy) occurs of a dull blackish-brown colour, earthy, sectile, and soft. It burns with a clear flame and agreeable odour. It occurs at Carharrack mine in Cornwall, in France, the Harz mountains, and Asia.

2. *Compact bitumen* (*schlakiges erdpech*, Leonh.; *bitume solide*, Haüy; *asphalt*) occurs of a brownish-black colour, massive, brittle, and of a shining resinous lustre; specific gravity is but little more than water. It occurs in Cornwall, France, Germany, and in the Dead Sea.

3. *Elastic bitumen* (*elastiges erdpech*, Leonh.; *bitume élastique*, Haüy) occurs of various shades of brown, and is soft and elastic, about the weight of water, possessing a strong bituminous odour. It burns with a large flame and much smoke, and has received the name of “mineral caoutchouc,” on account of its elasticity.

Bitumen is one of the oldest minerals of which we have any record. It was used by the Egyptians for cement, and for embalming.

PETROLEUM occurs of a reddish-black colour, rather thicker than common tar, possessing a disagreeable bituminous odour, and burning with a very thick black smoke. It occurs at Ormskirk in Lancashire, at St. Catherine's Well near Edinburgh, and in the Hebrides; also in France, and plentifully in Persia.

NAPHTHA (*le napthe*, Brong.) occurs of a slightly yellowish colour, transparent, burning with a blue flame and much smoke. It is the only fluid which contains no oxygen, and on this account is much used for chemical purposes, to preserve substances which usually ignite when in contact with any sub-



stance containing that gas. It occurs in Asia, Italy, Sicily, and America.

AMBER (*bernstein*, Leonh.) occurs of various shades of yellow or light brown, in roundish masses enclosing insects, either ants, spiders, flies, or the ichneumon—this last is, however, rare. It is generally transparent, possessing strong electric properties. It yields, by distillation, *succinic acid* (or acid of amber, from *succinum*, the Latin for amber), leaving a black shining coal. It belongs to the tertiary formation, and occurs in Germany, Prussia, France, Greenland, Moravia, and occasionally in the gravel near London.

SULPHUR (*schwefel*, Leonh.; *soufre*—French) occurs in a variety of forms, either crystallized, compact, earthy, investing, or cellular. The form of the crystal is the acute octohedron. It possesses a conchoidal fracture, burning with a blue flame and suffocating odour. It is of two formations, *natural* and *volcanic*; the first occurring in beds in primitive and secondary rocks in Hungary, Spain, and Switzerland; and the second, in deposits in the neighbourhood of volcanic districts. The most remarkable deposits are those of Solfaterra, near Naples, and the sulphur island in the Japanese Sea. The specific gravity of sulphur is 2.0.

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## EXHIBITION OF INDUSTRY OF ALL NATIONS, TO BE HELD IN LONDON IN 1851.

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For the earliest suggestion of forming in England periodical Exhibitions of the Products of Industry, the nation is indebted to H. R. H. Prince Albert, President of the Society of Arts and Sciences, and whose object was communicated to some of its members in 1845. Various committees were then formed, with a view of carrying out the object, but the public evinced an indifference to the measure, and manufacturers were found to be lukewarm in its promulgation and assistance,—hence the attempt was for a time abandoned. In the course of the past year, several meetings having been held, and it was in the end determined upon, that an Exhibition for the Products of Industry of “all Nations” should take place in London, the month of May, 1851, being named as affording complete time for collating the various and numerous articles and products which should render the exhibition one of importance and universal interest. The progress made by the Committee since their appointment has



appeared in the leading journals and various publications devoted to science, and in January last no less than six thousand influential names were subscribed and transmitted to the Executive Committee as supporters of the plan.

On the 8th of that month the Royal Commission was issued, and shortly afterwards the general details were made public. As in these the products of the mineral kingdom take a prominent position, we have pleasure in submitting the first Report, together with a Classified List, and the Local Committees at present formed.

### REPORT.

HER Majesty's Commissioners for the promotion of the Exhibition of the Works of Industry of all Nations, to be holden in 1851, having had the various subjects of their inquiry under their anxious consideration, are now prepared to state, for the information of the public, the progress they have made in determining on the different points referred to in their announcement of the 11th January last.

The decisions they have been able to come to have been necessarily limited by their present want of knowledge as to what pecuniary means will be placed at their disposal; and the shortness of the time during which this vast organization will have to be completed, renders it imperative upon the commissioners to make an earnest appeal to the country, to enable them, as soon as possible, to know upon what amount of subscriptions they may ultimately rely.

The scale upon which this important undertaking will be conducted must depend entirely on the amount of pecuniary support which it shall receive from the public. Her Majesty's commissioners appeal with confidence to all classes of the community, to enable them to make such liberal arrangements as will insure the success of this undertaking, in a manner worthy of the character and position of this country, and of the invitation which has been given to the other nations of the world to compete with us in a spirit of generous and friendly emulation.

The commissioners have fixed upon the 1st day of May, 1851, for opening the exhibition.

The commissioners will be prepared to receive and take charge of, at the expense of the commissioners, all articles which may be sent to them, and delivered at a place to be named by the commissioners in London, on or after 1st of January, 1851, and will continue so to receive goods until the 1st of March inclusive, after which day no further goods will be received.

Her Majesty has been graciously pleased to grant a site for this purpose on the south side of Hyde-park, lying between the Kensington-drive and the Ride commonly called Rotten-row.

From the approximate estimate which the commissioners have

been able to make, they believe that the building ought to cover a space of from 16 to 20 acres, or about one million of square feet.

The productions of all nations will be exhibited together, under one general classification.

The articles exhibited will be divided into four sections, as before announced, and a classified list, together with general instructions affecting each department, are appended.

The building will be provided to the exhibitors free from rent, and will be fire-proof.

Exhibitors will be required to deliver their objects, at their own charge and risk, at the building in the Park ; but no charges of any kind will be made whilst they remain there.

Colonial and foreign productions will be admitted without paying duty, for the purposes of exhibition, but not for internal consumption. Her Majesty's Commissioners of Customs will consider all such articles as bonded goods ; and her Majesty's commissioners for the exhibition of 1851 will make suitable arrangements for their reception.

Her Majesty's commissioners are desirous that there should be complete local organization, and that the local committees, wherever formed, should themselves collect the subscriptions within their own districts. The local committees should advertise all subscriptions they receive, and defray all local expenses, paying such commission for collection as they may think necessary.

Her Majesty's commissioners think that the same complete system of organization should be extended as much as possible to the British Colonies.

Subscriptions should be paid to the treasurers of local committees, and by them transferred to the general fund at the Bank of England, in the name of A. K. Barclay, Esq., W. Cotton, Esq., Sir J. W. Lubbock, Bart., S. M. Peto, Esq., M.P., and Baron Lionel de Rothschild, M.P.

Her Majesty's commissioners having undertaken the absolute control over the expenditure of all money that may come into the hands of their treasurers, have made arrangements for auditing accounts, and insuring the strictest economy.

Her Majesty's commissioners hope that the funds to be placed at their disposal by voluntary contributions may be such as to enable them so to regulate the amount to be paid for entrance that all classes may be enabled to visit the exhibition.

Should any surplus remain, after giving every facility to the exhibitors and increasing the privileges of the public as spectators, her Majesty's commissioners intend to apply the same to purposes strictly in connection with the ends of the exhibition, or for the establishment of similar exhibitions for the future.

However large the building may be, the quantity of articles

sent for exhibition may exceed any amount of space that may be provided ;—her Majesty's commissioners consequently reserve themselves ample powers of rejection and selection. Upon the amount subscribed must necessarily depend the space which they may be enabled to allot, but under all circumstances they will have to exercise a certain discretion.

Her Majesty's commissioners also desire that the local committees will, as early as possible, procure an inventory or general specification of articles proposed to be exhibited from their districts, and of the space which will be required for their exhibition, in order to enable the commissioners to determine as soon as possible the extent and the proportions of the building.

Her Majesty's commissioners are in communication with the Foreign Office concerning the means of informing foreign governments of the arrangements making for the exhibition.

Her Majesty's commissioners are considering the principles upon which the prize fund of 20,000*l.* shall be appropriated, and the best mode of adjudication.

If there may be any points upon which the local committees may require information, and will address themselves to the secretaries of the commission, her Majesty's commissioners will be happy to afford it to them, so far as it may be in their power.

### CLASSIFIED LISTS OF OBJECTS

*Which may be admitted to the Exhibition of the Works of Industry of all Nations, to be opened in London, 1st May, 1850.*

**SECTION I.** Raw Materials and Produce,—illustrative of the natural productions on which human industry is employed.

**SECTION II.** Machinery for Agricultural, Manufacturing, Engineering, and other purposes, and Mechanical Inventions,—illustrative of the agents which human ingenuity brings to bear upon the products of nature.

**SECTION III.** Manufactures,—illustrative of the result produced by the operation of human industry upon natural produce.

**SECTION IV.** Sculpture, Models, and the Plastic Art generally,—illustrative of the taste and skill displayed in such applications of human industry.

This division of the objects for exhibition into four sections will be generally preserved. Articles belonging to one section may, however, be admitted to another, where they may be considered necessary, but in such cases for illustration only.

### SECTION I.—RAW MATERIALS AND PRODUCE.

Under raw materials in this section are to be included all products of the Mineral, Vegetable, and Animal Kingdoms, either in an entirely raw state, or in any stage of preparation, previous to arriving at the state of a finished manufacture (as in Section III.). They are classified according



to their uses to man, in their original state and in their chemical and mechanical transformations.

## (A.)—MINERAL KINGDOM.

### 1. USED IN METALLIC MANUFACTURES :—

#### (a.) ORES, AND MODES OF DRESSING.

Native Metals, or Metallic Ores,—the modes of dressing, such as crushing, stamping, jigging, buddling, or otherwise rendering them merchantable ; as in the cases of antimony, arsenic, bismuth, cadmium, cobalt, copper, gold, iron, lead, mercury, nickel, palladium, platinum, silver, tin, zinc, &c.

#### (b.) METALLURGICAL PROCESSES.

The Various Methods of Roasting and Smelting the Ores, so as to illustrate processes. Fluxes, slags, and other materials which may serve the purposes of illustration. The various processes used in adapting metals for particular purposes, as for making iron into cast iron, malleable iron and steel, &c.

#### (c.) ALLOYS.

Bronzes of various kinds, such as statuary, gun, bell, and speculum metal, Britannia metal, brass of different kinds, German silver, Argentine and other varieties of white metal, pewter, type metals, sheathing metal, compounds of metals with phosphorus and other non-metallic bodies, &c.

#### (d.) METALS IN PROCESS OF ADAPTATION TO FINISHED MANUFACTURES.

Rolled and drawn in sheets, wires, &c., and cast in pigs, bars, &c., plated and electrotyped metals, &c.

### 2. CHYMICAL PRODUCTS :—

#### (A.) CHYMICAL SUBSTANCES EMPLOYED IN MANUFACTURES.

##### (a.) *Non-Metallic Substances.*

Such as carbon in its various states for the purposes of fuel, charcoal, coke, bituminous coal, anthracite, lignite, artificial fuels, products of distillation of coals, mineral oils and naphtha ; phosphorus in its different states ; sulphur as in the manufacture of sulphuric acid, &c. ; muriatic acid, nitric acid, boracic acid, &c.

##### (b.) *Alkalies, Earths, and their Compounds.*

Such as potash and its salts, as carbonate, sulphate, and chlorate of potash ; nitre, native and artificial, the latter as made in Asia, France, Switzerland, Sweden, and as used for gunpowder, &c. ; soda and its salts, as common salt and its various modes of preparation, nitrate of soda, borax, soda ash, and carbonate of soda native and as prepared either from salt, barilla, or kelp, and as used for soap or glass-making, &c. ; sulphate of soda, &c. ; lime and its compounds, as limestone, chalk, marbles, mortars, and hydraulic limestone, cements, materials for frescoes, plaster of Paris, gypsum, alabaster, bleaching powder, &c. ; magnesia, and the materials for



preparing it and its salts; barytes, as sulphate of barytes; strontia for coloured fires, &c.; alumina, as alum slate, alum, sulphate of alumina, &c.

(c.) *Metals Proper, and their Compounds.*

Such as iron and its salts, iron pyrites for green vitriol, colcothar, ochre, Venetian red, or as used for calico printing and dyeing, sulphate of iron as used for making sulphuric acid, &c.; copper, as acetate and sulphate of copper as used for colours and dyeing, for electrotyping, &c., verdigris, Scheeles' green, verditer, carbonate of copper, &c.; zinc and its salts, zinc paint, &c.; tin and its compounds, as salts of tin, stannates, oxymuriate, &c.; lead, as white lead, acetate and nitrate of lead, Naples yellow, &c.; chromium, as chrome ore, chromates of potash, yellow and orange chromate of lead, oxide of chromium for colours, as for glass, pottery, &c.; arsenic, as Scheeles' green, orpiment, realgar, &c.; antimony, as sulphuret of antimony for percussion powder, lucifer matches, &c.; bismuth, as pearl white, &c.; cobalt, as oxide of cobalt for pottery colours, smalt blue, &c.; nickel, for glass staining, &c.; tungsten, as the yellow oxides, tungstates for dyeing, &c.; mercury, as for philosophical instruments, silvering mirrors, &c.; gold, platinum, silver, and the other noble metals, their preparations for electrotyping, giving of metallic lustres, &c.

(d.) *Mixed Chemical Manufactures.*

Such as soap, prussiate of potash and Prussian blue, ultramarine, &c.

(B.) CHEMICAL SUBSTANCES USED IN MEDICINE.

(a.) *Non-Metallic Substances.*

As iodine, bromine, chlorine, sulphur, phosphorus, charcoal, and their compounds, &c.

(b.) *Alkalies, Earths, and their Compounds.*

As carbonates, chlorides, sulphates, nitrates, phosphates, &c., and other compounds of potash, soda, lime, and magnesia, &c.

(c.) *Metallic Preparations.*

As calomel, corrosive sublimate, red oxide, and bisulphuret of mercury, and other compounds; salts of silver, copper, iron, antimony, zinc, &c.

(C.) RARER SUBSTANCES, MANUFACTURED CHIEFLY FOR THE USE OF THE SCIENTIFIC CHEMIST.

Iodine, bromine, selenium; potassium, sodium, and other rare metallic bases and their compounds, &c.

3. USED IN THE MANUFACTURE OF GLASS, POTTERY, AND EARTH-ENWARE :—

(A.) GLASS.

(a.) *Coarser Materials used in Glass-making.*

As sand, chalk, carbonates of soda and potash, sulphate of soda, gypsum, common salt, rock salt, soapers' waste, gas lime, lime clay, &c.

(b.) *Colours and Chemical Materials used in further Processes of Glass-making.*

Compounds of arsenic, antimony, boracic acid, borax, barytes, copper, chromium, cobalt, gold and iron, litharge, red lead, oxides of manganese, nickel, uranium, silver, saltpetre, smalt blue, phosphate of lime, &c.

(c.) *Various kinds of Glass used for Manufactures.*

Soluble or water glass, crown, window, and mirror; crystal, flint, and strass glass; German sheet and plate glass; glass for optical and for laboratory purposes; coloured and stained glass, enamel, aventurin, glass for artificial gems, &c.

(B.) PORCELAIN AND POTTERY.

(a.) *Materials used, and the modes of dressing and preparing them for use.*

Kaolin, Cornish stone, plastic clays, sand, quartz, flints, felspar, chalk, gypsum, soda, potash, salt, alum, borax, bone ash, peroxide of tin, oxides of lead, cobalt, nickel, chromium, iron, copper, manganese, &c.

(b.) *Finer kinds, as used for Manufacturing Purposes.*

Porcelain hard and tender, earthenware, stone ware, flint ware, fayence, delft ware, ironstone china, &c. Materials and processes illustrating the mixing, mouldings, pressing, drying, glazing, colouring, printing, staining, painting and gilding, &c.

(c.) *Coarser kinds, as used for Manufacturing Purposes.*

Materials for bricks, house and field draining tiles and pipes, common jars, bottles, pans, &c.

4. STONES AND MINERAL SUBSTANCES FOR BUILDING IMPLEMENTS AND DECORATION :—

(a.) EMPLOYED IN ARCHITECTURE AND ENGINEERING.

Granites, sandstones, limestones, serpentines, porphyries, marbles, bricks, tiles, earthen tubes, artificial stones, plasters, cements, earths, pounded rocks, and other paints made with simple natural substances, &c.

(b.) IMPLEMENTS.

Grindstones, chert, honestones, diamonds, rubies, emery, and other hard materials for cutting gems, less valuable materials and glass, or as used in the construction of watches, &c.

(c.) PERSONAL DECORATION.

Gems of all kinds, and all varieties of mineral substances used for decoration, as agates, cornelians, onyxes, lapis lazuli, &c.

## (B.)—VEGETABLE KINGDOM.

## 1. SUBSTANCES USED CHIEFLY AS FOOD, OR IN ITS PREPARATION :—

- |                         |       |   |                |
|-------------------------|-------|---|----------------|
| I. Agricultural produce | .. .. | { | Cereals.       |
|                         |       |   | Pulses.        |
|                         |       |   | Oil seeds, &c. |

II. Dried fruits and seeds.

III. Substances used in the preparation of drinks.

IV. Spices and condiments.

V. Starch series.

VI. Sugar series.

VII. Fermented liquors and distilled spirits from unusual sources.

## 2. MATERIALS USED CHIEFLY IN THE CHEMICAL ARTS, OR IN MEDICINE :—

VIII. Gum series.

- |                  |       |   |                      |
|------------------|-------|---|----------------------|
| IX. Resin series | .. .. | { | Resins and balsams.  |
|                  |       |   | Gum resins.          |
|                  |       |   | Gum elastic.         |
|                  |       |   | Volatile oils.       |
|                  |       |   | Drying fat oils.     |
| X. Oil series    | .. .. | { | Non-drying fat oils. |
|                  |       |   | Solid oils.          |
|                  |       |   | Wax.                 |

XI. Acids.

XII. Dyes and colours.

XIII. Tanning substances.

XIV. Intoxicating drugs.

XV. Medicinal substances.

## 3. MATERIALS FOR BUILDING, CLOTHING, ETC. :—

XVI. Fibrous substances—cordage and clothing materials.

XVII. Cellular substances.

XVIII. Timber and fancy woods, for construction and ornament, and prepared by dyeing, &amp;c.

## 4. MISCELLANEOUS SUBSTANCES :—

XIX. Miscellaneous substances not elsewhere enumerated.

## (C.)—ANIMAL KINGDOM.

## 1. SUBSTANCES USED AS FOOD :—

Almost every part of almost every species of animal serves as food to some variety or other of the human race. Preparations of food as examples of industrial products, for the exhibition, would comprise,—specimens of preserved meats for long voyages; portable soups; concentrated nutriments; consolidated milk, &c.; dried gelatine, isinglass, and albumen; caviare; trepang; sharks' fins, nests of the Java swallow, and the like articles of Eastern commerce; honey and its preparations.

## 2. SUBSTANCES USED FOR MEDICINAL PURPOSES :—

Cod liver and other animal oils, for internal or external application.  
 Unguents of spermaceti, lard, oil, and combinations of these.  
 Musk, castoreum, civet, ambergris (as antispasmodics).  
 Phosphorus and ammonia (from bones, hartshorn, urine).  
 Crabs' eyes, or the calcareous concretions formed in the craw fish;  
 and cuttle bone, used as antacids.  
 Cantharides, and their essence cantharidine.  
 Iodine (obtained from marine zoophytes and sponge).

## 3. SUBSTANCES USED IN MANUFACTURES :—

## (a.) FOR TEXTILE FABRICS AND FOR CLOTHING.

Wool, hair, hair bands and ropes; bristles, whalebones.  
 Silk from the silkworm, *Bombyx mori*, and from other species in  
 India, e. g. *Bombycilla Cynthia* and *Attacus Paphia*.  
 Feathers, down, fur.  
 Skins, hides, leather.  
 Elytra or beetle wings (for ornaments of dress).  
 Byssus, from the pinna shellfish (manufactured into gloves).

(b.) FOR DOMESTIC OR ORNAMENTAL PURPOSES, OR FOR  
THE MANUFACTURE OF IMPLEMENTS.

Bone, horn, hoofs, ivory, tortoiseshell, shagreen, parchment, vellum,  
 quills.  
 Pearls (*Meleagrina margaritifera*, *Unio margaritifera*); seed pearl  
 (*Mytilus edulis*).  
 Coral.  
 Oils, tallows, spermaceti, wax, lard.  
 Silkworm gut.  
 Mother of pearl (shells of *Meleagrina*, *Haliotis*, and *Turbo*)—buffalo  
 shells, Bombay shells, black shells, white-edge shells, yellow-edge  
 shells, flat shells, green snail shells.  
 Sponge, goldbeaters' skin, catgut, bladders.

## (c.) AS AGENTS IN THE MANUFACTURE OF VARIOUS ARTICLES.

Glue, isinglass, gelatine.  
 Bone black, ivory black, animal charcoal.

## (d.) FOR THE PRODUCTION OF CHYMICAL SUBSTANCES.

Bones, &c. (for phosphorus, ammonia, cyanides, &c.).

## (e.) FOR PIGMENTS AND DYES.

Cochineal, carmine, from the *Coccus cacti*; dyes from the galls of  
 aphides; gall stone pigment from ox gall; lac, a substance obtained  
 from an Indian species of *coccus*, and the varieties called in com-  
 merce *stick lac*, *seed lac*, *lump lac*, *shell lac*, *lac lake*, *lac dye*,  
 sepia, Essence d'Orient, from scales of bleak (*Leuciscus*), used in  
 the manufacture of artificial pearls.



## SECTION II.—MACHINERY.

## DIVISION A.—MACHINES FOR DIRECT USE.

## 1. PRIME MOVERS.

As boilers and furnaces for generating steam, steam-engines, water-wheels and other hydraulic movers, windmills, other engines for generating power, &c.

## 2. SEPARATE PARTS OF MECHANISM AND GEERING.

As toothed wheels, linkwork, belts, couplings, contrivances for modifying motion, for reversing and stopping, and for the government and self-action of machinery, &c. Specimens of perfection in workmanship—such as straight edges, flat surfaces, screws, spheres, &c.

## 3. MACHINES FOR RAISING AND MOVING BODIES.

Raising water and other liquids, as pumps, fire engines, hydraulic rams, &c.

Raising and moving weights and producing pressure, such as crabs, cranes, travellers, screw jacks, hydraulic presses, pile drivers, &c.

Carriages and vehicles.

Machinery of the railway system.

Naval mechanism and naval architecture.

## 4. MACHINES FOR WEIGHING, MEASURING, AND REGISTRATION.

As weighing machines of all kinds, apparatus for the measurement of length and capacity, for the registration of natural phenomena, and of the results and operations of other machinery, as tide gauges, anemometers, calculating machines, tell-tales, counting machines, numbering frames, copying machines, dynamometers, &c.

Turret and other clocks, watches, and chronometers.

Mathematical and philosophical instruments, as astronomical and optical instruments, apparatus for the graduation and division of lines and circles, physical and chymical apparatus.

## 5. INSTRUMENTS AND MISCELLANEOUS CONTRIVANCES.

Drawing instruments and apparatus used by artists and engravers.

Musical and acoustical instruments, as organs, pianofortes, harps, flutes, imitation of the human voice in singing and speaking, &c.

Surgical instruments.

Locks, and small machines for miscellaneous purposes.

## 6. CANNON AND SMALL ARMS, PISTOLS, &amp;c.,

And all that belongs to their equipment.

## 7. AGRICULTURAL MACHINERY.

Field Implements—As ploughs, subsoil-plough, skim-plough, harrows, Norwegian harrow, clod-crusher, grubber, or scarifier; corn-drill, turnip-drill, water-drill, dry-manure machine, liquid-manure machine, horse-seed dibbler, roller, presser, horse-hoe, one-horse cart, horse-rakes, hay-making machines.

Yard Implements—Thrashing-machine, corn-dressing machine, chaff-cutter, turnip-cutter, cake-bruise, corn-bruise; movable steam-engine; tile-machine, draining tools.  
Garden implements.

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**DIVISION B.—MANUFACTURING MACHINES, OR SYSTEMS OF MACHINERY, TOOLS, AND IMPLEMENTS EMPLOYED FOR THE UNDERMENTIONED PURPOSES :—**

**1. MANUFACTURE OF ALL FABRICS THAT ARE SPUN, WOVEN, FELTED, OR LAID.**

Machinery for the complete formation from the raw material of all fabrics of cotton, wool, flax, hemp, silk, caoutchouc, hair, &c.

Paper making and staining.

Printing and bookbinding.

**2. MANUFACTURES OF METALS.**

The manufacture of metals from the ore into bars, rods, wire, sheets, and other general forms; also casting and polishing of metal, glass, &c.

The cutting and working of metals by machine tools, such as lathes, machines for planing, drilling, boring, slotting, sawing, stamping, shearing, rivetting, punching, &c.

Machines and tools used by the makers of gold, silver, and plated goods, cutlery, nails, screws, pins, needles, buttons, and metallic pens, &c.; by locksmiths, dye-sinkers, furnishing ironmongers, &c.

**3. MANUFACTURES OF MINERAL SUBSTANCES.**

Machines and tools for the preparation and working of all kinds of stone, granite, alabaster, slate, clay, gems, &c.

**4. MANUFACTURES OF VEGETABLE SUBSTANCES.**

Machines and tools for the preparation and working of all kinds of wood. Mills and other machinery for grinding, crushing, or preparing vegetable products.

**5. MANUFACTURES OF ANIMAL SUBSTANCES.**

Machinery and tools for working in horn, bone, ivory, leather, &c.

**6. MACHINERY AND APPARATUS FOR BREWING, DISTILLING, AND MANUFACTURING CHYMISTRY.**

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**DIVISION C.—MODELS OF ENGINEERING STRUCTURES, EXHIBITING THE APPLICATION OF MECHANICAL CONTRIVANCES.**

Models of bridges, viaducts, roofs of large span, in stone, wood, iron, &c. Models of docks, locks, lighthouses, breakwaters, harbours, landing-piers, &c.

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## SECTION III.—MANUFACTURES.

MANUFACTURES TO BE EXHIBITED IN THIS SECTION MUST BE IN THEIR FINISHED STATE, AS FIT FOR USE.

## 1. FABRICS.

SPUN AND  
WOVEN

From flax, hemp, cotton, and similar vegetable substances.

From wool and silk, and similar animal substances.

FELTED OR  
LAID

From fur and hair, and similar animal substances.

From rags and fibre, and similar vegetable substances.

as

Goods plain and figured in the loom; also printed, coloured, or embossed, including

LINENS, CANVAS—Floor cloths, calicoes, &c.; oil-cloths of all kinds; also, lace, bobbinet, figured lace, needlework, embroidery, tambouring, &c.

BROAD CLOTHS—Blankets, carpets, shawls, damasks, satins, velvets, stuffs, poplins, tabinets, crapes.

FELTS, HATS—Felted floor cloths and felted fabrics generally, plain or printed, coloured and embossed.

PAPERS of all kinds, plain and ornamental paper-hangings and decorations, cards, pasteboard, &c.

## 2. MANUFACTURES IN METALS.

—Gold and silver, copper and zinc, iron, steel, lead, bronze, pewter, mixed metals.

as

Gold and silver, plate and jewellers' work, metal ornaments, metal mountings, buttons, locksmiths' work, wire work, general ironmongery, fenders and grates and fireirons, bronze lamps, Britannia metal wares, German silver and white metal; cutlery and steel ornaments.

3. MANUFACTURES IN GLASS, PORCELAIN, TERRA COTTA, AND  
EARTHENWARE OF ALL KINDS, &c.

## 4. MANUFACTURES FROM VEGETABLE SUBSTANCES. — Wood, straw, hemp, grass, caoutchouc, gutta percha.

as

Cabinet work and household furniture, turnery, baskets, mats and matting, cordage and cables, straw plait, utensils of every kind in caoutchouc and gutta percha, coopers' work, &c.

- |   |        |  |
|---|--------|--|
| 5. MANUFACTURES FROM ANIMAL SUBSTANCES.—Ivory, bone, horn, parchment, leather, shell, hair, feathers, and bristles. | } as { | Handles and utensils of horn, ivory, and bone; bookbinding, leather cases, trunks, harness, boots and shoes, brushes, &c.          |
| 6. SMALL WARES AND CHYMICAL COMPOUNDS.  |        | Umbrellas, garments, artificial flowers, fringes, gimps, beads and toys; confectionery, soap, candles, sealing-wax and wafers, &c. |

## SECTION IV.—SCULPTURE, MODELS, AND THE PLASTIC ART.

OBJECTS FORMED IN ANY KIND OF MATERIAL, IF THEY EXHIBIT SUCH A DEGREE OF TASTE AND SKILL AS TO COME UNDER THE DENOMINATION OF FINE ART, MAY BE ADMITTED INTO THIS SECTION.

- |                              |        |   |
|------------------------------|--------|---|
| 1. SCULPTURE, AS A FINE ART. | } as { | a. In metals, whether simple, as gold, silver, copper, iron, zinc, lead; or compound, such as bronze, electrum, &c.           |
|                              |        | b. In minerals, whether simple, as marble, stone, gems, clay, &c.; or in materials elaborated from them, as glass, porcelain. |
|                              |        | c. In woods and other vegetable substances.   |
|                              |        | d. In animal substances, such as ivory, bone, shells, shell-cameos.   |
|                              |        |   |

### 2. WORKS IN DIE-SINKING, INTAGLIOS.

- |                               |  |                         |
|-------------------------------|--|-------------------------|
| 3. ARCHITECTURAL DECORATIONS. | } Whether integral or adventitious, as { | In relief.              |
|                               |  | In colour.              |
|                               |  | Stained glass tapestry. |

- |                             |   |                         |
|-----------------------------|---|-------------------------|
| 4. MOSAICS AND INLAID WORK. | { | In stone.               |
|                             | { | In tiles.               |
|                             | { | In vitrified materials. |
|                             | { | In wood.                |
|                             | { | In metal.               |

### 5. ENAMELS.

- |   |            |
|---|------------|
| { | On metals. |
| { | On china.  |
| { | On glass.  |



6. MATERIALS AND PROCESSES APPLICABLE TO THE FINE ARTS  
GENERALLY, including Fine Art Printing, Printing in Colour, &c.

7. MODELS.                   { In architecture.  
                                  { In topography.  
                                  { In anatomy.

## CONDITIONS AND LIMITATIONS.

All spirits, wines, and fermented liquors, unless derived from unusual sources, are inadmissible, except in special cases and under special restrictions; and when oils, spirits, &c., are exhibited, to prevent accidents they must be shown in well-secured glass vessels.

All highly inflammable articles, such as gunpowder, detonating powders, lucifer-matches, &c., and all live stock, and articles perishable within the duration of the exhibition, are inadmissible, unless specially excepted.

### SECTION I.—RAW MATERIALS AND PRODUCE.

#### DIVISION (A).—MINERAL KINGDOM.

It is desirable that the raw materials should be shown in connexion with the produce of the mineral kingdom, so as to form a history and explanation of the processes employed to fit them for the useful and ornamental purposes of life. The exhibition would thus comprehend (1) illustrations of the various modes of extracting and preparing the raw materials for produce; (2) illustrations of methods of reducing, working, or combining raw materials, so as to obtain products which may afterwards receive applications to the useful or ornamental purposes of life.

The specimens fitted for exhibition should include (1) only those remarkable for their excellence, for novelty in their occurrence or application, or economy of their extraction or preparation; or (2) those remarkable as illustrations of some further processes of manufacture.

#### DIVISION (B).—VEGETABLE KINGDOM.

The objects which the Commission is most desirous of receiving among the products of the vegetable kingdom are such as from their utility, novelty, or practical interest may appear especially deserving public attention. Peculiarly fine samples of substances in common use; authenticated samples of substances having similar properties, but derived from different sources, such as arrow-root, sago, &c. Dyeing materials, accompanied by specimens exhibiting the effect of such materials. Fancy wood, both in the polished, rough, and manufactured state. All sorts of materials which are applicable to the manufacture of linen, cordage, wickerwork, paper, and the like.

Nothing, however, appears suitable to this exhibition except such results of human industry as are capable of being preserved without injury through several months.

#### DIVISION (C).—ANIMAL KINGDOM.

As illustrations in this division, the various processes of preparation may be exhibited in connexion with the raw materials; and in some cases

a finished article may be introduced as the termination of a series of objects in preparatory stages.

Nothing, however, appears suitable to this exhibition except such results of human industry as are capable of being preserved without injury through several months.

## SECTION II.—MACHINERY.

### DIVISION (A).—MACHINES FOR DIRECT USE.

Machines will be exhibited in motion whenever it may be desirable to do so, and it may be found practicable to provide the necessary arrangements for that purpose.

### DIVISION (B).—MANUFACTURING MACHINES.

Although in arranging this class for exhibition it will generally be found advisable to separate products from the producing mechanism, yet the latter should always be accompanied with sufficient specimens of the raw material, in its several stages of manufacture, and of the finished product, to make the operation of the machinery intelligible.

The complete series of tools and machinery that belongs to the manufacture of any object of common use, such as a watch, a button, or a needle, accompanied by specimens of the object and its parts, in their various stages of progress, is so instructive and interesting that it is very desirable to obtain several such series for the proposed exhibition.

## SECTION III.—MANUFACTURES.

Manufactures to be exhibited in this section must be in their finished state, as fit for use.

All articles to be admitted in this section must exhibit one or more of the following qualifications:—

1. Increased usefulness, such as permanency in dyes; improved forms and arrangements in articles of utility, &c.
2. Superior skill in workmanship, as in block-printing, chasing, &c.
3. New use of known materials.
4. Use of new materials.
5. New combinations of materials, as in metal and pottery.
6. Beauty of design, in form or colour, or both, with reference to utility.
7. Cheapness, relatively to excellence of production.

## SECTION IV.—SCULPTURE MODELS, AND THE PLASTIC ART.

Objects formed in any kind of material, if they exhibit such a degree of taste and skill as to come under the denomination of Fine Art, may be admitted into this section.

The specimens exhibited shall be works of living artists.

Oil paintings, and water-colour paintings, drawings and engravings, are not to be admitted except as illustrations or examples of materials and processes, and portrait busts are not be admitted.

## LOCAL COMMITTEES.

Name of Town.	Sec. of Committee.	Name of Town.	Sec. of Committee.
Aberdeen .....	Reid, W. L.	Doncaster .....	Mason, T. B.
Aberystwith .....	Davies, J. M.	Dorchester .....	Stone, J.
Alton .....	Clements, James	Dover .....	Bass, T. B.
Arbroath .....	Macdonald, John		Stillwell, J.
Ashton-under-Lyne .....	Gartside, Henry	Dublin .....	Porter, W. B.
Barnard Castle....	Monkhouse, J. C.		Fry, William
Barnsley.....	Newman, Edward	Dudley .....	Blackwell, J.
Bath .....	Tunstall, J., M.D.	Dundee .....	Milne, George
	Akerman, W.	Dunfermline.....	Kilgour, James
Batley, Yorkshire	Jubb, Samuel	Durham .....	Forster, J. H.
Belfast .....	MacAdam, Jas., jun.	Edinburgh.....	Tod, James W. S.
Beverley .....	Crust, Thomas	Elgin .....	Duff, Patrick
Bilston .....	Perry, Charles	Exeter .....	Brutton, Charles
Bingley, York ...	Passavant, P., jun.	Falmouth & Penryn	Rundell, W. W.
Birmingham.....	Marshall, W. P.	Fleetwood .....	Stewart, J.
Blackburn .....	Clark, W. J. D.	Frome.....	Walters, G., jun.
Bodmin .....	Bray, R.	Glasgow.....	Johnson, William
Bolton, Lancashire	French, G. J.		Liddell, Andrew
Boston .....	Bontoft, J. A.		Strang, J., LL.D.
Bradford, York ..	Tee, Samuel L.	Glossop .....	Ball, John
	Taylor, George	Gloucester.....	Fryer, K. H.
Brampton .....	Graham, J., M.D.	Grantham .....	Ekin, Thomas
Brentford .....	Clarke, George	Gravesend .....	Sharland, George
Bridgenorth .....	Jones, William	Great Grimsby....	Daubeney, N. H.
Bridgewater .....	Smith, T.	Greenock .....	Hill, Ninian, M.D.
Bridport.....	Colfox, Thomas		Macnaughten, P.
Bristol .....	Wilkinson, John	Guildford .....	Haydon, S.
Bromsgrove .....	Maund, Benjamin	Halifax .....	Crosley, Frank
Buckingham.....	Nelson, G.		Carter, Richard
Burnley .....	Heelis, John		Brown, William
Burton-on-Trent..	Richardson, John	Hartlepool.....	Belk, Thomas
Bury St. Edmunds	Holmes, J. H.	Hastings .....	Rock, James, jun.
Bury, Lancashire..	Norris, W. H.	Hayle .....	West, W.
Camborne .....	Beckford, T. S.	Helston .....	Hill, Frederick
	Bridge, J. H.	Hereford .....	Johnson, Richard
Cambridge Univ...	C. Babington, M.A.	Hertford.....	Longmore, P.
Cambridge Town..	Gotobed, H.	Honiton.....	Devenisle, Samuel
	Harris, H. Hemington	Huddersfield.....	Greenwood, F.
Canterbury .....	Aris, John		Shaw, Joseph
Cardiff .....	Bird, Hugh		Laycock, J. C.
Carlisle .....	Nanson, John	Hull .....	Jacobs, Bethell
Cheltenham .....	Gwinnett, W. H.		Frost, Horace
Chelmsford .....	Meggy, George	Ipswich .....	Notecutt, S. A.
	Chancellor, Fred.	Isle of Wight ...	Eldridge, James
Chelsea .....	Rudge, Rev. E.	Kendal .....	Gandy, Gerard
Chester .....	Maddock, J. Finchett	Kensington .....	Morris, John
Chichester .....	Mason, J.	Kidderminster....	Hallen, Thomas
Chorley .....	Jackson, Richard	Kilmarnock .....	Wilson, James
Congleton .....	Latham, John		Brown, Alexander
Cork .....	Feath, G. C.	Kirkcaldy .....	Sang, William
Coventry .....	Skidmore, F. A.	Lancaster .....	Dunn, W.
Darlington.....	Humble, Stephen	Launceston .....	Gurney, Charles
	Mason, George	Leamington .....	Hanbury, J. B.
Dartmouth .....	Woolridge, Col.	Leeds .....	Wilson, Thomas
Deal .....	Reakes, Thomas		Kitson, James
Derby.....	Stevens, Henry J.		Cawood, Martin
	Every, Fred. S.	Leicester .....	Stone, S.
Devizes .....	Waylen, George		Wheeler, S. H.
Devonport.....	Woolcombe, T.	Lewes .....	Lower, M. A.
	Norman, Alfred	Lichfield.....	Lomax, T. G.



Name of Town.	Sec. of Committee.	Name of Town.	Sec. of Committee.
Limerick .....	Boyse, John	Rye .....	Dawes, E. N.
Lincoln .....	Major, R.	Scarborough .....	Moody, J. J. P.
Liskeard .....	Jago, James	Sheerness .....	Keddell, J. S.
Liverpool .....	Grantham, John	Sheffield .....	Plimsoil, Samuel
Llanelly .....	Thomas, John	Shrewsbury .....	Pidgeon, Henry
London .....	Catley, Rev. S. R.	Southampton ....	Deacon, C. E.
	Wire, D. W.	Southport .....	Lewis, Richard
Louth (Lincoln) ..	Ingoldsby, C.	South Shields ....	Elliott, Robinson
Macclesfield .....	Higginbotham, S.		Stevenson, A.
Maidstone .....	Mercer, John	Stafford .....	Turnock, James
Manchester .....	Fleming, Hugh	Stamford .....	French, William
Merthyr Tydvil ..	Wolrige, J. C.	St. Austell .....	Drew, J. H.
Middlesborough ..	Gitkes, Edgar	St. Columb .....	Collins, G. B.
	Fallowes, W.	St. Helen's .....	Fincham, Fred.
Montreal (Canada)	Leming, John	Stirling .....	Boyd, A.
	Lyman, Henry		Morrison, P. G.
Montrose .....	Myers, G. C.	Stoke-upon-Trent	Battam, Thomas
Newestl.-und-Lyne	Mayer, T. W.	Stourbridge .....	Gibson, G. W.
Newcastl.-on-Tyne	Wotsoh, Joseph	Stroud .....	Freston, W. A.
	Burnett, Thomas	Stockport .....	Vaughan, John
Newport (Monmth)	Latch, Thomas	Stockton .....	Crosby, John
Northallerton ....	Jefferson, W. T.		Laing, Joseph
Northampton ....	Rands, G., jun.	Sunderland .....	Candlish, John
Norwich .....	Leman, R.		Snowball, William
	Willett, Henry	Swansea .....	Francis, G. G.
Nottingham .....	Enfield, William	Tamworth .....	Thompson, J.
	Rawson, George	Taunton .....	White, Eales
	Butler, Rev. W. J.	Tewkesbury .....	Thomas, Joshua
Oldham .....	Radcliffe, Henry	Tower Hamlets ..	Humphreys, John
Oxford .....	Walker Rev. R., M.A.	Truro .....	Simmons, G. N.
	Spiers, Richard J.	Uttoxeter .....	Beadon, Thomas
	Plowman, Joseph	Wakefield .....	Witham, James
Paisley .....	Martin & Hodge	Walsall .....	Newman, J. W.
Penzance .....	Pearce, Richard	Warrington .....	Marsh, J. Fitchett
Perth .....	Reid, Archibald	Warwick .....	Tibbits, James
	Greig, William	Waterford .....	Nevins, Hugh N.
Plymouth .....	Arthur, Oswald C.	Wellington (Salop)	Benson, J.
Poole .....	Welch, Martin K.	Westminster .....	Drew, G. H.
Portsmouth .....	Deacon, Henry	Wexford .....	Dillon, Rev. E.,
	Howard, John		M.R.I.A.
Preston .....	Cartwright, S.	Whitby .....	Cramp, W. H.
Putney and Roe-			Belcher, Henry
hampton .....	Fulton, H. H.	Whitehaven .....	Armitstead, R.
Ramsgate .....	Burgess, George	Wigan .....	Acton, Thomas
Redruth .....	Peters, John L.	Winchester .....	Bailey, Charles
Reigate .....	Martin, Peter	Windsor .....	Voules, Charles S.
Richmond (Surrey)	Chapman, William	Wolverhampton ..	Walker, Thomas
Richmond (Yorksh)	Cooke, Leonard	Worcester .....	Webb, Edward
Ripon .....	Nicholson, R. W.	Yarmouth, Great ..	Palmer, C. J.
Rochester .....	Prael, R.	Yeovil .....	Batten, J., jun.
Rotherham .....	Barras, John	York .....	Munby, Joseph
Runcorn .....	Simpson, John		Richardson, H.

We sincerely trust that the exhibition thus announced will, as we cannot for a moment doubt, be carried out with that spirit, regard to justice, and impartiality, which would appear to be the guiding rule observed by the Executive Committee; while it would be to us, as to every Englishman, a source of regret, if so truly great a design, reflecting the highest honour on the illustrious prince with whom it has emanated, should be in any



way marred by those petty jealousies or obstacles which are too frequently put forward by parties who possess not a mind whose basis is liberality and universality of feeling; but of this we augur no apprehensions need arise, were it only the merit due to his royal highness Prince Albert, for thus originating so noble an institute, worthy as it is of the support of the English nation. The Executive Committee have imposed upon themselves an important duty, and must be held responsible, not only to England but to the whole world—they have the power placed in their hands, if wisely and temperately used, of strengthening the generous rivalry of industry between nations, and thereby securing the bonds of amity and peace; while after ages will hail the present era as that which seized on and availed itself of the first and greatest step to render all mankind brothers, and create that peace and concord, which it is our fondest hope may be found to reign over the earth.

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## PATENT

### TOUGHENED CAST IRON AND MALLEABLE IRON.

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THE Report of the Commissioners appointed to inquire into the application of iron to railway structures, published in July last, is a document of the utmost importance to engineers, and to all persons connected with the construction of massive iron structures, more particularly where firmness and strength are required. From the general results of the evidence adduced, the Commissioners are of opinion that any legislative enactments with respect to the forms and proportions of iron castings employed in such structures would be highly inexpedient; and among the recommendations with which they close their report, the necessity is particularly impressed on the minds of engineers, that in contracting for large castings they should stipulate for iron to bear a certain weight. As it is most important to all engineers and architects having to employ iron in the form of girders, beams, &c., for fire-proof buildings and other erections, where lightness, combined with strength, is a desideratum, to know that Mr. Stirling's iron, in round numbers, is double the strength of common irons, and from 40 to 50 per cent. stronger than the very best, it is our intention here to record a few of the experiments, the results of which furnished the evidence before the Commissioners. In these times, when engineers are obliged to use every means to execute their works as cheaply as possible, the diminished weight of material is of the first importance.

Mr. Eaton Hodgkinson, in his experiments for the commission, found

that bars ten feet long and two inches square, with the supports nine feet apart, broke as follows :—

	lb.
Blaenavon iron, No. 2 .. .. .	1,220
Low Moor iron, No. 1 .. .. .	1,207
Bars cast at Warrington, composed of Madely Wood, 8; Lilles- hall, 6; Pontypool, 3½; and charcoal iron, 5 parts .. .. .	1,375
Stirling's second quality, composed of Calder hot-blast No. 1, with 20 per cent. of malleable scrap .. .. .	2,174

This iron is termed second quality, because a still stronger mixture, more especially adapted for large castings, is produced by employing a No. 3 iron with the requisite proportion of malleable scrap. In a series of experiments made at the Dundyvan works, and described at page 416 of the report, the strength of bars of this mixture, of the same size as the foregoing, is shown to be much greater, the breaking weight being 2,601 lb. We may here remark how nearly Mr. Hodgkinson's experiments correspond with those made at Dundyvan, as the two series on *No. 1 patent toughened iron* will show :—

	lb.
Hodgkinson .. .. .	2,174
Dundyvan .. .. .	2,152
Ditto .. .. .	2,234

The opinions expressed in the report by Mr. Fairbairn, Mr. May, Mr. Thomas Cubitt, and several other of the witnesses examined, who have made themselves acquainted with the patent iron, are highly satisfactory and fully conclusive as to its great superiority.

At page 9 are found the results of some experiments, by Mr. Hodgkinson, on the tensile strength of the same iron, to be above twelve tons per square inch; the average of seventeen other descriptions of iron experimented on having given between six and seven tons, thus showing that Mr. Stirling's iron is nearly 100 per cent. stronger than the average. The kind of iron called Stirling's third quality, employed in these experiments, contained cinder, and, although stronger than any other iron experimented on by Mr. Hodgkinson, is not recommended by Mr. Stirling, and is not now made. Written communications have been received from the managers of large bar-iron works, stating that the toughened iron is found exceedingly well adapted for all the heavy bar-iron work machinery employed in the iron manufacture. Rolls and pinions cast from it are much sounder and stronger than those made from any other iron. Pinions especially give great satisfaction, as they stand the wear and tear of working much longer, and as the stoppage of the machinery, which, under general circumstances, so frequently takes place, is thus avoided. Much advantage is also obtained by using this iron in the construction of cast girders, as *much greater strength is obtained, with a large saving in weight*. At page 101 an abstract is given, showing the crushing strength per square inch, in which we also find Mr. Stirling's iron to be nearly 50 per cent. superior in strength to sixteen other sorts of iron experimented on. Had Mr. Stirling's No. 3, or 3 extra iron, been submitted to the same tests, the resistance to crushing force would have been very much greater.

At page 417 an abstract is given of a number of experiments made on

the comparative strength of Stirling's patent and common malleable irons, from which we extract the following :—

							Breaking strain in Tons per Square Inch.
Average given by Mr. Jesse Hartley from experiments at Liverpool							
on many sorts of malleable iron	..	..	..	..	..	..	23'23
Average of S. C. Crown iron, as used and regularly tried at Wool-							
wich dockyard ..	..	..	..	..	..	..	24'47
Average best Dundivan bar	..	..	..	..	..	..	24'33
Average Mr. Stirling's best quality	..	..	..	..	..	..	27'81
Average „ another „	..	..	..	..	..	..	27'07

Attention must be called to some varieties of the patent iron, which are remarkable for their extreme stiffness, both tensilely and transversely, which are recommended to form the wearing surfaces of rails, tires, &c., and for all purposes where such qualities as stiffness and toughness are desirable. We have ourselves seen fractured specimens of rails, formed of common iron for the body, and the patent hardened iron for the wearing surface, in which the hard crystalline character of the latter gives decisive evidence of its high power to resist compression, lamination, and abrasion.

The average stretch of malleable iron, in two-feet lengths of round bars 1 inch diameter, may be taken at from 3 to 5 *inches*, or from the table before us,  $4\frac{1}{2}$  *inches*, while the average of Mr. Stirling's hardened malleable irons is for one kind  $\frac{3}{4}$  *inch*, and for the other  $\frac{1}{4}$  *inch*, in the permanent set of the same-sized bar, as before described, of common iron when loaded, so as to show its resistance to transverse strain may be taken at 2'12 *inches*, while that of one variety of the hardened iron is 1'02 *inches*.

The iron bridge across the Thames, at Windsor, now constructing by Mr. Page, and the cast portion of the bridge erecting at Yarmouth, by Mr. James Walker, are of Mr. Stirling's patent toughened cast iron.

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## MISCELLANEA.

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### MINERALOGY.

COMPOSITION AND USES OF ANTHRACITE.—Anthracite consists of carbon in considerable quantities, with a small proportion of silica; there are several varieties, the principal of which are massive, slaty, and columnar; the massive is of an iron-black colour, occasionally with a splendid metallic lustre—it burns without flame or odour, leaving a white ash. The slaty is of a brownish-black colour, easily frangible, somewhat sectile and brittle; vast deposits of it exist in the United States, the most celebrated of which is the anthracite region, as it is called, of the Susquehanna, in Pennsylvania; it is between sixty and seventy miles long, and about five broad, constituting a trough or elongated basin through which the Susquehanna river and



**Lackawanna creek flow.** In England it is found near Walsall, in Wales in the southern parts of Brecknockshire, Carmarthenshire, and Pembroke-shire, near Cunnock and Kilmarnock in Scotland, and at Kilkenny in Ireland. The columnar occurs in prismatic concretions, either straight or curved—it burns without flame or smoke. It is principally found at the Meisner in Hesse, forming the upper portion of a bed of brown coal, which is covered by basalt. In Ayrshire, and some of the Newcastle pits, it occurs in contact with dykes of greenstone—at the former frequently passing into plumbago. Being more difficultly inflammable than bituminous coal, it is principally used in limekilns, maltkilns, iron foundries, &c. When ignited in considerable quantities, it burns with a strong and durable heat; much of the difficulty of kindling may be overcome by the addition of a little charcoal, and the proper application of a current of air. In the northern states of America, where common coal is little known, this forms the principal fuel of the maritime cities, and is there in general use for every purpose of raising temperature. At Freyberg in Saxony, and elsewhere, it is used instead of charcoal in the refining of copper. Mineral carbon, or mineral charcoal, is nearly allied to it; this occurs in thin layers and fibrous concretions of a delicate silky black colour, in most of the coal-fields of Great Britain, at Voitsberg in Styria, Disko Island, Greenland, and elsewhere.

**JET.**—Pitch coal, or jet, is generally of a velvet black; it occurs in elongated reniform masses, and sometimes in the shape of branches, with a regular woody structure; this is visible internally only by transmitted light, and in specimens cut extremely thin; it has then a brown translucent appearance. It presents a brilliant resinous lustre; and a perfect conchoidal fracture; is soft and brittle, and little heavier than water; burns with a greenish flame and strong bituminous smell, leaving a yellowish ash. Jet occurs principally in marly, schistose, or sandy beds, in several places in France, where it is sometimes found enclosing amber, and near Wittemberg in Prussia, and in detached fragments in the amber mines on the coasts of the Baltic. In England it occurs in aluminous shale, at Whitby in Yorkshire. It is worked into various trinkets, chiefly used for mourning, but when not sufficiently fine and hard for that purpose, it is used as fuel. Cannel coal receives a polish, and is occasionally made into snuff-boxes, inkstands, &c.

**RED SILVER.**—This beautiful mineral is confined to a small number of localities, though in some of them it is of pretty frequent occurrence. The light red varieties are met with principally in the Saxon and Bohemian districts of the Erzgebirge, particularly at Marienburg, Annaberg, and Johangeorgenstadt in Saxony, and Joachimsthal in Bohemia. It is usually associated with other ores of silver, galena, blende, pyrites, and arsenic. The dark red varieties occur chiefly with calcareous spar, native arsenic, and galena, at Andreasberg (in the Hartz), Freiberg (in Saxony), Schemnitz and Nagybanja (in Hungary), Guadacanal (in Spain), Kongsberg (in Norway), and St. Maire aux Mines (in France). It was formerly found at Huel Duchy in Cornwall, and from some of the Mexican mines vast quantities have been obtained. Red silver, from its colour, may sometimes be mistaken for red orpiment; but the yellow streak of the latter is well defined, and its specific gravity lower. Cinnabar volatilizes before the blow-pipe, while red silver forms a metallic globule. As an ore, it has been observed that the dark yield a larger proportion of silver than the light—that from Joachimsthal contained sulphuret of silver, 74·35, sulphuret of arsenic, 25·00.

**FLEXIBLE SULPHURET OF SILVER.**—This rare mineral has hitherto been met with only in Hungary, and at Freyberg in Saxony, and even at those localities in a very small quantity. It consists of silver, sulphur, and a little iron. It is externally of a dark colour, approaching to black. It



occurs both massive and in small tubular crystals, which appear to be right oblique-angled prisms, the lateral planes of which are alternately  $125^{\circ}$  and  $55^{\circ}$ . Flexible when in thin laminæ, and readily separated into them. Cleavage parallel with the terminal planes, very soft, and yields readily to the knife. Lustre metallic, but less brilliant than that of sulphuret of silver.

**CINNAMON STONE.**—This is a combination of silicate of alumina, silicate of lime, and silicate of the peroxide of iron; it commonly occurs in masses, which are full of fissures. Its general colour is red, with occasionally a brown or orange-yellow tinge, translucent, rarely transparent, fracture flat conchoidal, lustre vitreo-resinous, scratches quartz with difficulty. Before the blow-pipe it is fusible with ebullition into a darkish green glass, and with borax melts very readily into a transparent glass, more or less feebly tinged by iron. It has been found in considerable masses in some of the primitive rocks of Ceylon, and embedded in limestone at Malsjö in Sweden, but is most commonly met with in grains among the sand of certain rivers, both in Ceylon and in Brazil. The Romanzovite of Nordenskjöld, which occurs at Kimito in Finland, is considered a variety of cinnamon stone.

**VANADIUM.**—This scarce mineral was discovered during the year 1830, by M. Serstrom, in a Swedish iron remarkable for its ductility. It is the produce of the iron-mine at Taberg, not far from Jönköping. It exists also in an ore of lead which occurs at Zimipan in Mexico, which was analyzed in 1801 by Del Rio, who stated that it contained a new metal, which he denominated erythronium. It was subsequently found that the new metal was chromium. M. Sefstrom extracted vanadium from the scorix of the Taberg iron, which he found richer in that metal than the iron itself.

**IODINE.**—Though non-metallic, this is considered a mineral substance. It exists in sea-water, and in the water of several natural springs. It was discovered in 1812, by M. Courtois, of Paris. It is found in shining scales, having the lustre of steel, or micaceous iron ore, the specific gravity of which is 4.948. At  $225^{\circ}$  Fahr. it fuses, and at  $347^{\circ}$  forms a rich violet-coloured vapour. It forms acids with oxygen, hydrogen, and chlorine; but it is a very rare production of nature.

**METEORIC STONES.**—The first of which we have any accurate account fell on Wednesday, the 7th of November, 1492, at Ensisheim, near Basle, on the Rhone. Its fall to the earth was accompanied by a loud clap of thunder; its noise was heard at Lucerne and several other places. It weighed 255 lbs. It was considered so great a curiosity, that it was ordered by the emperor Maximilian to be pierced and hung in the church. A very large stone, which was observed to fall from the atmosphere in the year 1751, in Croatia, is preserved in the Museum of Vienna. One of 1,600 lbs. weight was discovered by Professor Pallas in Siberia; this, however, is greatly exceeded by the one mentioned by Don Rubin de Celis, as lying on the plains of Peru, which he calculated to be of the enormous weight of 15 tons. Meteoric iron has been imitated by alloying nickel with native iron, in the proportion of 90 iron to 10 of nickel.

**KUPFERSCHAUM.**—This is a combination of oxide of copper, arsenic acid, water, and carbonate of lime. The primary form is a right rhombic prism; it occurs in rhomboidal plates, which present perfect cleavage, parallel to the faces of the rhomb. It is generally found in small aggregated and diverging fibrous groups, of a pale apple-green, or verdigris-green colour, inclining to sky-blue, and translucent. Before the blowpipe, it fuses readily in the platina forceps into a pebbly copper red scoria. Upon charcoal it intermixes, disengages an argillaceous odour, and melts into a green scoria, containing numerous grains of metallic copper. With borax it forms a green limpid glass, and with soda is reduced. It is found disposed in the cavities of calamine, associated with barytes, calc, spar, or

quartz, in the Bannat, at Libethen in Hungary, Nerzschinsk in Siberia, Schwartz in the Tyrol, Saalfeld in Thuringia, and Matlock in Derbyshire.

**LAPIS-LAZULI.**—Lapis-lazuli is composed of silica 49·0, alumina 11·0, lime 16·0, soda and potash 8·0, oxide of iron 4·0, magnesia 2·0, sulphuric acid 2·0. Its specific gravity is 2·95. It is found massive; sometimes, but rarely, in rhombic dodecahedrons of an azure-blue colour. The texture of the massive is fine-grained, or compact, with a glimmering lustre, and is hard enough to scratch glass, though it scarcely gives sparks with steel. It is nearly opaque; its blue colour is not uniform, as it frequently encloses iron pyrites, compact felspar, and quartz. On charcoal it fuses with difficulty into a white glass, when pure; with salt of phosphorus it is soluble, with effervescence, the portion melted burning with great brilliancy; with soda it is partly soluble into an opaque greenish-grey glass, which assumes a red appearance on cooling; and, if previously calcined and reduced to powder, loses its colour in acid. The finest specimens are brought from China, Persia, Lake Baikal in Siberia, and Bucharia. Lapis-lazuli is highly esteemed by the lapidary, but is chiefly important as affording the beautiful pigment ultra-marine, so highly valued by painters.

**SOAPSTONE.**—Potstone, steatite, and soapstone are of the same family. The soapstone of Cornwall is found massive and nearly white, or of a grey colour, sometimes with a tinge of yellow, and mottled with green and purple. When first raised, it may be kneaded like dough, but on exposure loses part of its moisture, and is then translucent on the edges, yielding to the nail, and possessing an unctuous feel. Steatite is found in considerable masses, in beds or veins. The Arabs are said to use it, instead of soap, to soften the skin; and Humboldt states that the Otomaques, a savage race inhabiting the banks of the Oronoko, are almost entirely supported, during three months of the year, by eating a species of steatite, which they first slightly bake, and then moisten with water. The whiter varieties are used in the manufacture of porcelain; others are used for fulling. Potstone is a coarse indistinctly granular variety of indurated talc, having a greenish-grey or leek-green colour, with a glistening or pearly lustre. It is found at Chiavenna in the Valteline, at Como in Lombardy, and, generally speaking, in serpentine countries; in Norway, Sweden, Finland, and Greenland. Its united properties of infusibility, softness, and tenacity, admit of its being readily turned on the lathe. From time immemorial it has been formed into vessels in the Valais and Grisons; and Pliny describes it as being used in this manner in his time. It is extensively employed in Norway and Sweden for the construction of furnaces and stoves for domestic purposes.

**INTRODUCTION OF PLATINA INTO ENGLAND.**—Platina was first called by the Spaniards "plata de pinto." It was brought into England by Mr. Charles Wood, in the year 1746. He obtained it in Jamaica, from a Spaniard, who brought it from Carthagena in New Spain. Its principal deposits are in Brazil and Siberia.

**GRAPHITE.**—Although this mineral is commonly called blacklead, it contains no particle. It is mineralogically known under the name of plumbago. It contains a considerable quantity of carbon, with a small proportion of iron; that of Cornwall consists of 96 carbon, 4 iron; its colour is iron or steel-grey. It has a glistening metallic lustre, a granular and uneven texture, is unctuous to the touch, sectile, and the thin laminae very flexible, not very brittle, with a shining lead colour streak. Before the blowpipe it becomes yellow or brown, after long-continued heat, but is infusible, nor is it affected by the addition of any reagent. It belongs chiefly to primitive rocks and the coal formation. The purest and most esteemed plumbago is found at Borrowdale in Cumberland, where it occurs in rocks consisting chiefly of grauwacke, and whence it is obtained in considerable quantities for the manufacture of pencils. It occurs likewise at

Pargos in Finland, in Greenland, in the United States, in Norway, in Ceylon, and many other places. In addition to its being extensively used in the manufacture of pencils, graphite is employed in the fabrication of crucibles, particularly those required for the purposes of the mint, as they sustain intense heat, and are esteemed for their tenacity and expansibility. It is also used to diminish the friction of machinery, and to protect iron from oxidation.

**DOLOMITE.**—This is generally called magnesian limestone. It occurs massive, and has sometimes a slaty texture; it consists of fine crystalline grains, which are lamellar; is generally white, occasionally with a tinge of yellow or grey; is translucent on the edges, and when struck frequently, emits a phosphorescent light, which is visible in the dark. It greatly resembles primitive limestone, but is readily distinguished by its feeble effervescence in acid. It occurs in the Pyrenees, Saxony, France, Sweden, Iona, and in an impure state in many counties of England—Somersetshire, Yorkshire, &c. Near Sunderland it forms globular, earthy-like, concretions; in the same vicinity it is found in slaty masses, which, when split in thin pieces, are very flexible—a quality supposed to depend on the water it contains, as it is nearly lost when the mineral dries. Gurhofion, which is a variety, is of a snow-white colour, and very compact; the fragments, which are sharp, are translucent on the edges—fracture flat conchoidal. It is often taken for semi-opal. It occurs in veins traversing serpentine, between Gurhof and Aggsbach, in Lower Austria. The mortar obtained from this species is esteemed for cement, being less subject to decay, owing to its absorbing less carbonic acid from the atmosphere than common limestone. For agricultural purposes it is of inferior value; when laid on particular soils, it tends to injure rather than improve vegetation—this effect is owing to the magnesia it contains. The cathedral of Milan, the Minster and city walls of York, are built of magnesian limestone; the white marble of Paros, and that of Iona, in the Hebrides, belong to this species; it, therefore, often admits, as well as limestone, of being cut and polished, and is supposed to be particularly durable.

**SULPHATE OF URANIUM.**—Johannite, or hydrous sulphate of uranium, mixed with sulphate of copper, occurs in extremely small crystals, in Joachimsthal in Bohemia. It is a species as beautiful as it is rare, having only been observed in one mine, and that in 1809. Its colour is deep grass-green, translucent; lustre vitreous; streak pale siskin-green; taste slightly bitter; fracture imperfect conchoidal; partially soluble in water. Heated in the matrass, it yields much moisture, leaving a dark brownish mass; fused upon charcoal with soda, and then laid on a piece of silver and moistened, it blackens the metallic surface. In the reducing flame, with soda, a bead of copper is obtained. With borax, it forms a fine green glass, as well in the oxidating as in the reducing flame; in the latter it becomes red and opaque on cooling, exhibiting the presence of oxide of copper. With salt of phosphorus, only green colours are produced, that of the oxidating flame having rather the appearance of copper, the reducing more of uranium. It therefore contains water, sulphuric acid, and the oxides of copper and uranium, but in what proportions has not been determined. It was named by the celebrated chemist, Haidinger, in compliment to his imperial highness the Archduke John of Austria, the late vicar of the German empire.



## MECHANICS.

EARLY ACCOUNTS OF THE STEAM ENGINE.—Capt. Savery, a Cornish miner, was the first who contrived a steam-engine of practical utility; he, however, borrowed the idea from the *Century of Inventions*, written by the Marquis of Worcester; but, anxious to conceal the obligation, he purchased and destroyed all the copies he could find. Newcome, an ironmonger, and Cawley, a glazier, followed in his track. Humphrey Potter was the next. A story is related of him, that, when a boy, having to turn the cocks upon which the working of the engine depended, he one day observed, in the agony of his anxiety to join his companions at play, a method of attaching the cords which would make the engine perform his office for itself. This, however, has been discovered by competent authorities, and who all agree that the effect of his improvements was solely to increase the working speed. It was at that period a complex machine, with a diversity of catches and strings, which the great Watt simplified, and laid the foundation of the gigantic improvements which have taken place in the present century. The first successful engine which operated by means of a cylinder and piston was contrived by Thomas Newcomen, an ironmonger of Dartmouth, and John Cawley, a glazier of the same place, about the year 1710. This engine, as first constructed, was provided with a casing around the cylinder, for holding cold water, to accelerate the condensation of the steam, and the surface of the piston was covered with water, to prevent the passage of air through it. The steam was admitted from the boiler by a slide valve, or regulator, which was moved by hand, and after the cylinder was filled with steam, water was introduced into the external casing, by which, in process of time, the steam was condensed, and the piston made a stroke. This was, however, tedious work, and the engine was very untractable, until the method of condensing the steam by a jet of cold water was introduced, and the movement of the valves was effected by the engine. The improvements were the effect of accident, and the mode of their development is thus related by Desaguliers:—"In the latter part of the year 1711, Newcomen and Cawley made proposals to drain the water of a colliery at Griff, in Warwickshire, where the proprietors employed 500 horses, at an expense of £9,000 a year; but their invention not meeting with the reception they anticipated, in March following, through the acquaintance of Mr. Potter, of Bromsgrove, in Worcestershire, they bargained to draw water for Mr. Back, of Wolverhampton, where, after a great many laborious attempts, they did make the engine work; but not being either philosophers to understand the reason, or mathematicians enough to calculate the powers and proportions of the parts, they very luckily by accident found out what they sought for. They were at a loss about the pumps, but being so near Birmingham, and having the assistance of so many admirable and ingenious workmen, they came, about 1712, to the method of making the pump-valves, clacks, and buckets, whereas they had but an imperfect notion of them before. One thing is very remarkable; as they at first were working, they were surprised to see the engine go several strokes, and very quick together; when after a search they found a hole in the piston, which let the cold water in to condense the steam in the inside of the cylinder, whereas before they had always done it on the outside. They used before to work with a buoy to the cylinder, enclosed in a pipe, which buoy rose when the steam was strong, and opened the injection valve, and made a stroke; thereby they were capable of giving only six, eight, or ten strokes in a minute, till a boy named Humphrey Potter, in 1713, who attended the engine, added (what he called *scoggan*) a



catch that the beam always opened, and then it would go fifteen or sixteen strokes per minute. But this being perplexed with catches and strings, Mr. Henry Beighton, in an engine he had built at Newcastle-upon-Tyne, in 1718, took them all away but the beam itself, and supplied them in a much better manner."

**DIFFERENCE OF RAILWAY GAUGES.**—The broad gauge is 7 feet, the Irish gauge 5 feet 3 inches, and the narrow gauge 4 feet 8½ inches. The first locomotive in 1824 travelled at a rate of six miles an hour; in 1829, the *Rocket* attained a speed of fifteen miles an hour; in 1834, the speed of the *Fire Fly* was twenty miles an hour; in 1839, the *North Star* had progressed to thirty-seven miles an hour; at this present time locomotives move with a velocity of seventy miles an hour. Since the first introduction of railways, the quantity of fuel required for generating steam has been reduced five-sixths—that is, one ton of coal is consumed now, where formerly six were necessary.

**EARLY USE OF RAILWAYS.**—The first wooden railway was employed at Newcastle, in 1680, for transporting coals from the pits to the river Tyne, upon which duty, even at that time, there were employed from 400 to 500 carts. Slips of ground, of the requisite breadth for the railway, were marked out between the coal-pits and the river, and were either leased by the coal owners, or purchased of the different proprietors whose ground the proposed line of road intersected in its course. To obtain the most easy and regular descent, this line was varied in its direction, to meet the inequalities of the ground; or where these inequalities were inconsiderable, it was carried straight forward, and the regular slope made by embankments and cutting. The ground being then smoothed and levelled, large logs of wood, called sleepers, cut in equal lengths to the breadth of the road, were laid across it, and firmly bedded into it at short distances, to sustain and hold fast the rails, or slips of wood on which the waggon wheels were intended to run. These rails were made of beech, and were laid end to end, so as to form two continued lines of rails or wooden ridges, running parallel to each other, along each side of the road, crossing the large logs on each side of their extremities, on which they rested, as on so many foundations. The waggons were of the usual construction, but of a larger size, so as to contain several tons of coals, and set upon low wheels—the smoothness of the way rendering wheels of the ordinary size unnecessary. Where any steep declivity occurred on the road, this was called a run, or inclined plane, and on it the descent was retarded and regulated by a species of break, or crooked lever, termed a convoy, attached to the waggon and managed by the driver. The banks of the Tyne, near Newcastle, on each side are remarkably steep, but, instead of forming inclined planes on them, the railway was continued on a wooden stage, raised to the same height as the top bank of the river, and carried forward until it came perpendicularly over the river side, where a wooden platform, termed a staith, was erected, for the convenience of delivering the coals—the waggons being emptied into a trough, or spout, down which the coals descended, either directly into the ships, or the store below.

**PRODUCTION OF POWER BY STEAM.**—According to Mr. Craddock, to produce 95-horse power gross with steam, at 115 lbs. per square inch, it would require 1,736 lbs. of steam per hour, or 217 lbs. of coals; without expansion, at 18 lbs. per square inch, it would require 4,030 lbs. of steam per hour, or 504 lbs. of coal; without condensation or expansion, at 40 lbs. per square inch, it required 5,270 lbs. of steam per hour, or 690 lbs. of coals. The atmosphere is included in all the above pressures.

**STEAM-VESSELS ON THE MISSISSIPPI.**—In the vessels which ply on the Mississippi, the paddles are made with a clutch, or friction-strap, so that they may be thrown out of gear, and the engines may be turned, so as to feed the boilers, when the vessel is alongside a wharf, without moving the

paddle-wheels. The steam-vessels plying on the Mississippi are chiefly built at Pittsburg and Cincinnati.

**COMPETITION OF LOCOMOTIVES.**—The average of 12 trips, of 24 $\frac{3}{4}$  miles, up 1 in 440, on the Grand Junction Railway, with six engines—three made by Robert Stephenson & Co., and three by Sharpe, Roberts, & Co.—was 23 $\frac{3}{4}$  miles per hour, with a weight of 58 tons. The coke consumed was 864 lbs., and the steam power 48 lbs. per square inch. The engine, No. 7, on the London and Birmingham line, built by Mr. Bury, of Liverpool, went 10 miles in 10 minutes, on the 3rd October, 1838, with only one cylinder working—viz.: from Hampton to Birmingham, being 4 $\frac{1}{2}$  miles up 1 in 660, 3 $\frac{1}{2}$  miles 1 in 1,370; rest of the way was level, and the time included the getting up and slacking down the speed.

**ANCIENT FLYING SHIP.**—Aerial navigation by means of vessels is not a modern idea. In the 56th No. of the *Evening Post*, Dec. 22, 1709, a description and diagram of a flying ship is given, invented by a priest of Brazil, Bartholomew Laurent. In his address to the king of Portugal, whom he prays for a patent, he states, “that by it one may travel 200 miles in 24 hours, carry orders to generals in remote countries, as also letters, recruits, provisions, ammunition, and money; supplying besieged places with all necessaries, and transporting merchandise through the air.” This vessel, which was built with a square stern and figure-head, was to have her sails drawn from stem to stern, in the form of a semicircle. In the bottom of the vessel were bellows, to propel her when the wind was slack. From each side of the keel were huge wings to steady her, and the rudder was moveable. Between the sails and the deck was a cover, made of iron, in the form of a net, on which were fastened a quantity of amber beads, which, by some secret virtue, were to keep the ship afloat. At each end of the vessel were to be placed the celestial and terrestrial globes; these were of metal, and contained in them two loadstones, which were to draw, by their attraction, the ship after them, which was constructed of thin iron plate.

**STEAM-ENGINES OF THE ROYAL NAVY.**—The following table, compiled from the list of the steamers in the navy, is given in Messrs. Main and Brown’s work on the marine engine.

Name of firm.	Pad. wh. h.p.	Screw h.p.	Total h.p.
Seaward & Co. . . . .	5,790 . . .	1,920 . . .	7,710
Maudslay & Co. . . . .	5,520 . . .	1,510 . . .	7,030
Boulton & Watt . . . . .	3,365 . . .	— . . .	3,365
Miller & Ravenhill . . . . .	1,531 . . .	1,222 . . .	2,753
Penn & Co. . . . .	1,890 . . .	748 . . .	2,638
Messrs. Rennie . . . . .	2,017 . . .	150 . . .	2,167
R. Napier . . . . .	1,475 . . .	580 . . .	2,055
Fairbairn . . . . .	1,890 . . .	— . . .	1,890
Fawcett . . . . .	1,824 . . .	— . . .	1,824
Forrester . . . . .	910 . . .	— . . .	910
Scott & Sinclair . . . . .	760 . . .	— . . .	760
Rigby . . . . .	515 . . .	— . . .	515
Butterly & Co . . . . .	280 . . .	— . . .	280
Caird & Co. . . . .	240 . . .	— . . .	240
Coates . . . . .	144 . . .	— . . .	144
<b>Total. . . . .</b>	<b>28,151 . . .</b>	<b>6,130 . . .</b>	<b>34,281</b>

The value of this machinery, at £50 per horse-power, would be £1,714,050.

## CHEMISTRY.

**ANTIQUITY OF CHEMISTRY.**—The early history of chemistry is involved in darkness. The writings of the alchemists carry it up to the most remote antiquity, though nothing has been said satisfactorily as to the origin of their craft. Borrichus, and later authors, who felt that many of the processes of the artificers were dependent upon chemical agencies, thence inferred that they were the result of chemical knowledge. On these grounds, Tubal Cain, the first artificer in iron and brass, has been considered the father of metallurgical chemistry. There is also a story in Vossius, which was believed by Tertullian, that the knowledge of chemical principles was among the gifts bestowed by the angels who were led from heaven by the beauty of the daughters of the earth. Others, more moderate, deem Noah the first chemist, because he is said to have discovered the art of making wine. Du Fresnoy, in his "*Histoire de la Philosophie Herm.*," says that it was bequeathed to Ham and his descendants as a heritage. The Egyptians, among the nations of antiquity, appear to have possessed the greatest amount of chemical knowledge. They prepared sal ammoniac, common salt, vitriol, glass, enamel, tiles, painted earthenware, several metal and metallic alloys, soap, vinegar, beer, various medicines and pigments, and knew how to fix colours on silk by means of mordants. Whether the Chinese, who have long been acquainted with the preparation of sulphur, nitre, gunpowder, borax, alum, porcelain, verdigris, paper, together with dyeing, and the formation of various metallic alloys, are partly indebted to the Egyptians for their knowledge, is a question which must remain undecided.

**EXPERIMENTS WITH MURIATE OF TITANITE.**—A slender stick of tin being placed in a solution of the muriate of titanite, the solution becomes first rose, then ruby red, and then of an amethystine hue. Zinc thus produces first a violet, and then a deep indigo blue. The prussiate of potash produces a green precipitate from the muriate of titanium; and if an alkali be added while it remains with the same fluid, it passes through beautiful tints of purple and blue, becoming at the end white.

**FULMINATING GOLD.**—The ammoniacal oxide of gold, or fulminating gold, is formed from a nitro-muriatic solution, mixed with three or four times its weight of distilled water, by the addition of ammonia, until the precipitation is completed, but not beyond that point. The precipitate, which will weigh about a fourth more than the gold, is to be carefully washed and dried on paper. It is also formed whenever ammonia is introduced in any manner into the solution, and a precipitation is effected by any alkali. This precipitate explodes with a considerable noise by the application of a slight degree of heat, or by pressure, or by percussion. The fulmination results from the sudden and violent disengagement as well as condensation of the hydrogen of the ammonia and oxygen of the oxide, whilst uniting to form water, and the rapid escape of the nitrogen, the gold being left restored to its metallic form.

**FULMINATING SILVER.**—Ammoniacal oxide of silver, or fulminating silver, is obtained by the following process:—Nitrate of silver, being precipitated from its solution by lime, and placed on filtering-paper, to separate it from the moisture, is then to have a small portion of liquid ammonia poured on it. The mixture having remained 10 or 12 hours, if a bright pellicle appears, more ammonia is to be added. The fluid is afterwards to be decanted from the black precipitate, and evaporated in a retort, when it will become full of opaque crystals of a metallic appearance, which fulminate



on being touched, even under water. Both these crystals and the precipitate exceed in power gunpowder, and even fulminating gold. Fulminating silver, once thus obtained, can no longer be touched without a violent detonation, no more than one grain being sufficient to give rise to a dangerous fulmination. After this fulmination, the silver is found reduced, or revived—its oxygen having combined with the hydrogen of the ammonia, by which water, in the state of vapour, is produced. This water, instantly vaporized, and possessing all the elasticity and expansive force of that state, is the principal cause of the phenomenon, in which the nitrogen of the ammonia, with its whole expansibility, bears a part.

**FULMINATING MERCURY.**—Fulminating mercury may be obtained by the following process:—100 grains of quicksilver, dissolved with heat, in a measured  $1\frac{1}{2}$  ounce of nitric acid of 1.3 specific gravity, and being poured cold upon 2 measured ounces of alcohol of about 849, and a moderate heat applied, a powder precipitates, which is to be immediately washed on a filter, and dried with a heat little exceeding that of a water-bath. This powder takes fire at 368 Fahr.; it explodes by friction, by flint and steel, and by being thrown into concentrated sulphuric acid. It is equally inflammable under an exhausted receiver, as surrounded by air, and it detonates loudly either by the blow of a hammer or by a strong electrical shock. It appears to be composed of the nitreous etherized gas and of oxalate of mercury, with excess of oxygen.

**VARIATION OF GAS IN COAL.**—When decomposition is effected on the large scale, the quantity of gas is found to vary with the quality of the coal, and the manner in which the operation is conducted. According to Mr. Peckstone, a chaldron of Newcastle Wall's-End coal yields 10,000 cubic feet, being at the rate of  $370\frac{1}{2}$  cubic feet per cwt. At Edinburgh, a cwt. of Cannel coal yields 430 feet, and a similar return from coal of the same species is obtained at Glasgow, and other towns in Scotland.

**CAUSE OF THE COLOURING MATTER OF FRUITS.**—Guyton Morveau supposes the red colour of fruits to be owing to the reaction of their own acid on the colouring matter, and that tin in restoring the colour of violets attracts from it the acid which had turned it red; lead, bismuth, zinc, antimony, and particularly iron, doing the same. The metallic oxides are not equally powerful, but the oxide of tungsten, he thinks, is superior to all others in forming cakes for painters.

**ARSENIC ACID.**—This is a white substance, of a sour taste; it is anhydrous, deliquescent, and uncrystallizable. Its sp. grav. is 3.4. It requires for solution six parts of cold and two of boiling water. Its solution reddens vegetable blues, tastes acid and metallic, and is a virulent poison. When water is poured upon it, a part only is immediately dissolved, and another portion, as is the case with phosphoric acid, remains undissolved. After a time, upon agitating the solution, the whole is taken up. Heated to bright redness, it evolves oxygen, and is converted into arsenious acid. If dry arsenic acid be exposed to air, so as gradually to deliquesce, it sometimes forms crystals, which are extremely soluble, and have been considered to be probably hydrated acid. Arsenic acid gives a white precipitate with lime-water, and a peculiar reddish-brown with nitrate of silver. It yields a yellow deposit of a sulphuret of arsenic, when its solution is subjected to the action of a current of sulphuretted hydrogen gas. Arsenic acid consists, according to Berzelius, of—Arsenic 65.283, oxygen 34.717. Arseniates are produced by the union of this acid with the metallic oxides, and many which are insoluble may be formed by adding arseniate of potassia to their respective solutions. They are soluble in dilute nitric acid, and in such other acids as do not form insoluble compounds with their bases, and ammonia precipitates them from these solutions. They are readily decomposed by charcoal at a red heat, but many of



them, when heated alone, are unchanged, even at a higher temperature. They are decomposed when boiled in solutions of the fixed alkaline carbonates. The soluble arseniates generally give a white precipitate with lime-water; they are not immediately precipitated by solution of sulphuretted hydrogen. Protosulphate of iron gives a white precipitate, or yellowish, if arsenious acid be at the same time present. With acetate of lead, and acetate of zinc, they also give white precipitates.

**POLARIZATION OF LIGHT.**—According to Sir David Brewster, the following is the order in which the metals polarize most light in the plane of reflection:—Galena, lead, grey cobalt, arsenical cobalt, iron pyrites, antimony, steel, zinc, speculum metal, platinum, bismuth, mercury, copper, tin-plate, brass, grain tin, jeweller's gold, fine gold, common silver, and pure silver.

**COMPOSITION OF MOSAIC GOLD.**—There are several compositions of mosaic gold used by artists in varnished works. The following is the most generally known:—8 oz. of tin and of mercury being amalgamated together, are put into a matrass, with 6 oz. of sulphur, and 4 oz. of muriate of ammonia. The bottom of the matrass being ignited, the sulphuret sublimes; and if the heat be such as to make the mixture take fire, it is sublimed of a dazzling colour, in large hexagonal scales. The tin, minutely divided by its amalgamation, is oxidized by the muriatic acid of the muriate of ammonia; and the hydrogen, disengaged from the water of crystallization of this salt, combining with sulphur and caloric, forms a sulphuretted hydrogen gas. Muriatic oxide of tin and mercury, united with sulphur, in the form of cinnabar, also rises. The remaining oxide of tin and sulphur forms the mosaic gold.

**OXIDE OF OSMIUM.**—To obtain this oxide in a pure, solid, and crystallized state, grind together, and introduce when ground, into a cold crucible, three parts by weight of the insoluble powder, and one of nitre. The crucible is to be heated to a good red heat, on an open fire, until the ingredients are reduced to a pasty state, when osmic fumes will be found to arise from it. The soluble parts of the mixture are then to be dissolved in the smallest quantity of water necessary for the purpose, and the liquor thus obtained is to be mixed in a retort, with so much sulphuric acid, diluted with its weight of water, as is equivalent to the potassia contained in the nitre employed; but no inconvenience will result from using an excess of sulphuric acid. By distilling rapidly into a clean receiver, for so long a time as the osmic fumes continue to come over, the oxide will be collected in the form of a white crust on the sides of the receiver, and there melting, it will run down in drops beneath the watery solution, forming a fluid flattened globule at the bottom. When the receiver has become quite cold, the oxide will become solid and crystalline. One such operation has yielded 30 grains of the crystallized oxide, besides a strong aqueous solution of it. This may be agitated with mercury, and the product washed with hydrochloric acid, to remove the oxide of mercury which is formed. The osmium remains in the form of a metallic oxide, which acquires a metallic lustre by friction. When heated in the air, it burns into an oxide, and in its pulverulent state it is attacked by nitric acid; but after exposure to a red heat in close vessels, it becomes much less oxidisable. Osmium is extremely poisonous, and has an extraordinary influence on the brain and nervous system. Persons have been rendered delirious by inhaling osmic fumes.

**COMPOSITION OF FALSE GEMS.**—Wieland's composition for making paste is:—Powdered rock crystal, 4,056 grains; red lead, 6,300; pure potassium, 2,154; borax, 276; white arsenic, 12 grains; the whole to be fused until entirely clear. The colouring matter is obtained from the several metals. Gold: the purple of Cassius gives a fine ruby tint. Silver:

the oxide, or phosphate yellow. Iron: the oxides, blue, green, yellow, and brown. Copper: the oxide, a rich green when mixed with a small portion of tartar, which tends partially to reduce the oxide red. Antimony: a rich yellow. Manganese: black; in small quantities, purple. Cobalt gives blue of various shades, with the yellow of antimony or lead, green. Chrome produces fine greens and reds, depending upon its state of oxidation. The basis of all artificial gems is paste. Another formula is as follows, with the composition of the several false jewels:—

*Paste, or Strass*.—Rock crystal, 6 oz.; red lead, 9 oz. 2 drachms; pearl-ash, 3 oz. 180 grains; boracic acid, 180 grains; arsenic, 5 grains. Mix, and fuse in a Hessian crucible; keep it liquid for 24 hours, then let it gradually cool.

*Amethyst*.—No. 1. Paste, 16 oz.; oxide of manganese, 15 to 24 grains; oxide of cobalt, 1 grain. Fuse together.

No. 2. Paste, 4,608 grains; oxide of manganese, 36 grains; oxide of cobalt, 24 grains; purple of Cassius, 1 grain. Fuse together.

*Aventurine*.—Paste, 300 parts; protoxide of copper, 40 parts; iron scales, 80 parts. Fuse the glass, and after the reduction of the copper let the mixture cool very slowly. The metallic copper will remain diffused through the glass in a crystalline form.

*Beryl*.—Paste, 3,496 grains; glass of antimony, 24 grains; oxide of cobalt,  $1\frac{1}{2}$  grain. Fuse.

*Chrysolite*.—Paste, 5 lbs.; calcined peroxide of iron, 3 drachms. Fuse together.

*Red Cornelian*.—Paste, 2 lbs.; glass of antimony, 1 lb.; calcined peroxide of iron, 2 oz.; oxide of manganese, 1 drachm. Fuse together.

*White Cornelian*.—Paste, 2 lbs.; calcined bones, 1 oz.; washed yellow ochre, 2 drachms. Fuse together.

*Diamond*.—Peroxide of tin, fused at a very high heat.

*Emerald*.—No. 1. Paste, 9,216 grains; acetate of copper, 72 grains; peroxide of iron,  $1\frac{1}{2}$  grain. Fuse.

No. 2. Paste, 5 oz.; oxide of copper, 39 grains; oxide of chrome, 2 grains. Fuse together.

*Garnet*.—No. 1. Paste, 427 grains; glass of antimony, 210 grains; oxide of antimony, 2 grains. Fuse together.

No. 2. Paste, 512 grains; glass of antimony, 256 grains; purple of Cassius, 2 grains; oxide of manganese, 2 grains. Fuse together.

*Opal*.—No. 1. Paste, 10 lbs.; calcined bones,  $\frac{1}{2}$  lb.

No. 2. Paste, 1 oz.; horn silver, 10 grains; calcined bones, 26 grains; magnetic oxide of iron, 2 grains. Fuse together.

*Ruby*.—No. 1. Paste, 5 oz.; oxide of manganese, 1 scruple.

No. 2. Paste, 16 oz.; purple of Cassius, 168 grains; peroxide of iron, 168 grains; golden sulphuret of antimony, 168 grains; manganese calcined with nitre, 168 grains; rock crystal, 2 oz. Fuse together.

*Sapphire*.—No. 1. Paste, 4,608 grains; oxide of cobalt, 68 grains. Fuse together for 30 hours.

No. 2. Paste, 8 oz.; oxide of cobalt, 49 grains; oxide of manganese, a few grains. Fuse together.

*Topaz*.—No. 1. Paste, 840 grains; glass of antimony, 36 grains; purple of Cassius, 1 grain. Fuse together.

No. 2. Paste, 3,456 grains; peroxide of iron, 36 grains. Fuse together.

**ARTIFICIAL IRON PYRITES**.—Crystallized iron pyrites was artificially formed by Wohler. In a glass flask, or other convenient vessel, there were subjected to a slow heat peroxide of iron, sulphur, and hydrochloride of ammonia; these were intimately mixed, until all the ammoniacal salt was sublimed; the mass was then suffered to cool slowly, and afterwards washed with water. At the bottom of the vessel there were discovered

heavy octohedra and tetrahedra, of a yellow colour, which were identical with the common crystallized pyrites. The larger the mass of materials, the larger and more perfect are the crystals obtained.

**AFFINITIES OF PLATINA.**—Platina unites easily with bismuth. With antimony its fusion is facilitated; but its weight and ductility are lessened. By zinc it is rendered more fusible, the alloy being very hard. It unites easily with tin, the alloy being very fusible; and, unless the tin is in large proportion, very brittle. It unites very well with lead. One ounce of platina being cupelled with 20 ounces of lead, the platina gains the power of being forged and soldered completely. It will not unite with forged iron; but, melted with crude iron, the alloy is so hard that the file will not touch it. It is ductile in the cold, but breaks short when hot. With copper, the alloy is ductile. When the copper is in the proportion of three or four to one, it takes a fine polish, and does not tarnish for years. With silver, the alloy is hard, without ductility, and tarnishes; but with gold it can only be alloyed by the most violent heat, the colour of the gold being greatly altered, and the alloy possessing considerable ductility.

**COMPOSITION OF AQUA REGIA.**—Aqua regia is formed by the mixture of the nitric and muriatic acids, in the proportion of two parts of the former and one of the latter. Four ounces of sal ammonia, dissolved gradually in the cold, in 1 lb. of nitric acid, forms an aqua regia. The muriatic acid in these processes attaches to itself a portion of the oxygen from the nitric acid, and, thus oxygenized, escapes in a yellow fume, whilst the nitrous gas which belonged to the nitric acid thus deprived of its oxygen, is absorbed by the unaltered portion of nitric acid, which it discolours, and changes to nitrous, thus forming a mixture of muriatic and nitrous acid. The nitro-muriatic is of a yellow colour, and its specific gravity is less than that of either of the acids employed. It readily dissolves gold, which is not done by either of the other acids of which it is composed. It is employed by dyers for the solution of tin, which, Gren states, nitric acid corrodes and oxidises, without dissolving.

**SEPARATION OF NICKEL FROM COBALT.**—Wohler's method of separating nickel from cobalt is as follows:—The arsenic is expelled by roasting the powdered speise first by itself, then with the addition of charcoal powder, till the garlic smell can be no longer perceived. The residuum is to be mixed with three parts of sulphur and one of potash, melted in a crucible with a gentle heat, and the product beingedulcorated with water, leaves a powder of metallic lustre, which is a sulphuret of nickel, free from arsenic, while the arsenic, associated with the sulphur, and combined with the resulting sulphuret of potassium, remains dissolved. Should any arsenic still be found in the sulphuret, as may happen if the first roasting heat was too great, the above process must be repeated. The sulphuret must be finally washed, dissolved in concentrated sulphuric acid, with the addition of a little nitric; the metal must be precipitated by the carbonated kali, and the carbonate reduced with charcoal. In operating upon copper, nickel, or speise, in which nickel predominates after the arsenic, iron, and copper have been separated, ammonia is to be digested upon the mixed oxides of cobalt and nickel, which will dissolve them into a blue liquor. This being diluted with distilled water, deprived of its air by boiling, is to be decomposed by caustic potash, till the blue colour disappears, when the whole is to be put in a bottle, tightly stopped, and set aside to settle. The green precipitate of nickel, which slowly forms, being freed by decantation from the supernatant red solution of oxide of cobalt, is to beedulcorated, and reduced to the metallic state in a crucible, containing crown glass. Pure nickel, in the form of a metallic powder, is readily obtained by exposing its oxalate to moderate ignition.

**PREPARATION OF PURE GOLD.**—A preparation of this metal for the



gold wire and leaf manufacturers, and other uses, may be made by dissolving ordinary fine gold in thin plates or grains, in moderately strong nitric acid, into which muriate of soda is to be scattered at intervals, whilst a gentle heat is to be applied; sulphate of iron is then to be dissolved in cold water and filtered, as well as the solution of gold; then mix twelve parts of the former with one of the latter, and allow the mixture to rest for twenty-four hours or more. The brownish precipitate is then to be boiled in a little pure nitric acid, and the gold washed with distilled water; finally, it is to be melted with a little pure nitre, and thus a perfectly pure fine gold may be easily and cheaply obtained.

## MANUFACTURES.

**EARLY MANUFACTURE OF GLASS.**—The origin of the manufacture of glass is involved in much obscurity. The art was well known to the Egyptians. A passage in Pliny attributes the discovery of glass to accident. A merchant vessel, laden with nitre, or fossil alkali, was driven ashore on the coast of Palestine, near the mouth of the river Belus, a small stream running from the foot of Mount Carmel, in Galilee, into the Mediterranean. The mariners, unable to procure stones to rest their cooking vessels upon, used pieces of their cargo instead. The fire reduced the alkali to a soft state, and incorporating with the river sand, it melted down into a vitreous stream. This circumstance was communicated to the inhabitants of the district, who availed themselves of the hint, and engaged in the manufacture of glass. Strabo and Josephus both state that the sand for about half a mile round the mouth of the river Belus was peculiarly adapted to the manufacture of glass, and it was much used in the glass-houses of Tyre and Sidon. The first account we have of the manufacture of glass in England, dates from the year 1439, at which period the countess of Warwick contracted with John Prudde, of Westminster, to erect a magnificent tomb for the earl, her husband. John Prudde is thereby bound to use "no glass of England, but glass from beyond seas," which stipulation, besides showing that the art of making window-glass was known and practised in England, likewise indicates that it was inferior to what was obtained from abroad. The finer sort of window-glass was made at Crutched-friars, London, in 1557. Flint-glass was first manufactured in England at the Savoy House, in the Strand, and the plate-glass, for looking-glasses, coach-windows, and similar purposes, was made at Lambeth, by Venetian workmen, brought over in 1670 by the duke of Buckingham. The art of glass-making was introduced into Scotland in the reign of James VI. An exclusive right to manufacture it within the kingdom for the space of thirty-one years, was granted to Lord George Hay, in the year 1610. This right was transferred, in 1627, for a considerable sum, to Thomas Robinson, merchant-tailor, in London, who again disposed of it, for £250, to Sir Robert Mansell, vice-admiral of England. The first manufactory of glass in Scotland was established at Wemyss, in Fife.

**WHITE COPPER.**—White Copper was formerly much used in Germany, for the manufacture of stirrups, bits, and spurs, as well as several other articles. The principal establishment for its manufacture was at Suhl, in the small duchy of Saxe Hildburghausen. Its composition was:—Copper, 88·00; nickel, 8·753; sulphur, with a little antimony, 0·750; silex, clay, and iron, 1·750.

**STEEL MANUFACTURES IN FRANCE.**—The great seat for the manu-



facture of cutlery in France, is Chatellerhault, in the province of Poitou. All descriptions made there are, however, immensely inferior to our Sheffield wares.

**BIDDERY-WARE.**—This metal is so called from a city of that name in Hindoostan, about sixty miles north-west of Hyderabad. It resembles pewter or zinc, but the natives of the East prefer to give it a sable hue, in order to throw up the silver with which it is generally inlaid. Dr. Heyne says it is composed of—Copper, 16 oz.; lead, 4 oz.; tin, 2 oz. To every 3 oz. of the alloy, 16 oz. of spelter is added when the metal is melted for use. To give the ware its esteemed black colour, it is dipped in a solution of sal ammoniac, saltpetre, common salt, and blue vitriol.

**IRON-WORKS OF GREAT BRITAIN.**—Iron has been wrought in England since the time of the Romans, by whom works were established in the Forest of Dean in Gloucestershire. In Kent and Sussex, counties well supplied not only with iron ore, but also with timber, the only species of fuel then used in the furnaces, works were also established at a very early period. The production of iron was long retarded, from the nature of the fuel employed in smelting. Complaints were early made of the destruction of timber by the iron-works. In the reign of Queen Elizabeth, 1584, an act was passed, prohibiting the manufacturers of iron from using any but small wood, and establishing new works in any place within twenty-two miles of the city of London, and fourteen of the river Thames, as also in several parts of Sussex. Soon afterwards, Edward, Lord Dudley, invented a process for smelting iron ore with pit coal, instead of timber, and obtained a patent for his invention, which was exempted from the operation of the act, 21 James I. c. 23, setting aside monopolies; but the works of the inventor were destroyed by an ignorant rabble, and he was nearly ruined by his efforts to introduce and perfect a process which has eventually proved of immense benefit to the country. For many years the invention seems to have been forgotten, and it was not till about 1740, that the growing scarcity of timber, coupled with increasing demand for iron, caused the revival of the process. The ores principally employed were brown and red hematites. Earthy iron ores were also smelted, but it does not appear that the clay ironstones of the coal basin were then used. At that period there were fifty-nine charcoal blast-furnaces, whose annual produce was 17,350 tons of cast-iron. By the year 1788, several attempts had been made to reduce iron ore with coked coal, and there remained only twenty-four charcoal blast-furnaces, while there were fifty-three coke-furnaces in activity. The production of iron for that year was, by means of coals 48,000 tons, and by charcoal 13,100 tons—making a total of 61,900 tons. The iron-works of South Wales and Monmouthshire are comprised in a range of country extending in the direction of north-west and south-east about twenty-five miles from one extremity to the other. The works at Hirwain, in Brecknockshire, and Aberdare, in Glamorganshire, form the extreme points to the westward. But the great seat of the manufacture is Merthyr Tydvyl, from which there is a continued line of furnaces at Dowlais, Romoey, Tredegar, Howey, Beaufort, Nantyglo, Blaenfon, Varteg, Abersychan, and Pontypool. About the middle of the last century, Merthyr Tydvyl was an insignificant village. In 1755, the lands and mines, for several miles round the village, were let for ninety-nine years, at a rent of £200 per annum. The Staffordshire iron-works, including those of Warwickshire, are principally situated in the district which extends from Wolverhampton, round by Walsall to Birmingham, and thence round by Dudley. The principal seat of the works in Shropshire is Colebrooke-dale, where the improvement of the manufacture commenced. In Scotland, almost all the iron-works, with the exception of the Carron, contiguous to the Frith of Forth, and at Muirkirk, Ayrshire, are situated on the Clyde, at no great distance from Glasgow.

**MANUFACTURE OF BRASS IN PRUSSIA.**—At the brass manufactory at Hegermühl, near Potsdam, the materials of one charge are commonly 41 lbs. of old brass, 55 lbs. refined copper (gahrkupfer) granulated, and 24 lbs. of zinc. This mixture, weighing 120 lbs., is distributed into four crucibles, and fused in a wind-furnace, with pit-coal fuel. The waste varies from 2½ lbs. to 4 lbs. upon the whole.

**CORINTHIAN BRASS.**—This metal, so famous in antiquity, is a mixture of gold, silver, and copper, and is supposed to have been produced by the fusion of these metals, in which that city abounded, when it was sacked and burned by Lucius Mummius, in the 156th Olympiad, about 146 years before the Christian era. Of this valuable metal but little is known. Its epoch of being in use must have been very short, as we are told by Pliny the art of making it had been for a long time utterly lost, and no remains of it are now in existence.

**EARLY METALLIC MANUFACTURE IN ENGLAND.**—Until the last century the metallic industry of England was at a low ebb. In May, 1518, there was a rising of the workmen of London against the foreigners who sold metal goods. Macpherson, adverting to it, says, "The pretended crimes of these foreigners were, probably, their working cheaper, and being more industrious than our own people, whose exclusive privileges kept the foreigners in the out parts, and out of the freedom." This rising was considered of such momentous importance, that the statute of Henry VII. was revived for their protection. In this it is enacted that "no merchant strangers should brynge into the reolme of Ynglond to be soulede mans gyrdylles, harynis wrought for gyrdylles, poynts, laces of lede, purses, pouches, pynnes, knyvyys, hangers, taylour sherys, sesors, and yrens, cobords, tonges, fyer forkes, grydyrens, stocks, cocks, keys, hinges, ayny betyn gold or betyn silver, horse harneys, bittes, storroppes, currets, ston dyng condlesticks, hongyng condlesticks, holy water scoppers, chafyng dishes, hongyng covers, curtenrynges, closhes for gloves, bokelles for shoys, spones of tynn and lede, cheynes of wire, as well latten as of silver." The first mill for rolling and slitting of iron, in England, was constructed by Godfrey Box, of Liege, at Dartford, in 1590. A paper-mill now stands on the site.

**MANUFACTURE OF GOLD.**—Under the head "Gold made by Art with loss to the Workman," Gabriel Plattes, in his *Discovery of Subterranean Treasure*, gives an account of his transmutation of iron and copper to gold. His formula is this:—"I took 8 ounces of regulus of iron and copper, made as beneath is declared, and 16 ounces of common sublimate, bought at the apothecaries, and made these ingredients into a fine powder: first severally, and then I ground them well together, upon a marble stone, and so put them into a retort of a glass, and drew from them, first an oil, then a substance like butter, and lastly a yellow sublimate, tinted with the tincture of iron and copper, which yellow sublimate I rectified three or four times, till it was very pure; then I mixed it with equal parts of an amalgam of silver and quicksilver, made as beneath is taught, and put it into another retort of glass, and forced away all but the silver, which remained like yellow horn; this yellow silver I amalgamated again with new quicksilver, and set it in a gentle heat above a week; then in a very strong heat for six hours, so that the quicksilver rose up and fell down again upon the silver, till such time as it had carried up all the silver from the glass into branches, like trees; then I melted down the silver, and fined it, and parted it with aqua fortis, and had divers grains of pure and good gold abiding all trials; but the quantity would not pay for half the charge and labour. I made the regulus thus: I took 4 ounces of iron in stub nails, and made them red hot in a crucible, and then I put to it 8 ounces of crude antimony, and melted it down; and when it was well and thin melted, I let it cool in the pot, and so knocked off the

regulus from the top or cinder which lay upon the top of it; then I did the like with 4 ounces of copper in thin plates, and then I mixed equal parts of these two, and melted them three or four times, every time casting into the pot half an ounce of saltpetre, as it was melting, to purify it, till it was pure and bright, almost like silver, but yet brittle, so that I could beat it in a mortar to fine powder. The yellow silver that was like yellow horn did amalgamate with much difficulty and grinding with salt and vinegar, and some of it was lost, do what I could; but the first silver was water silver, which I bought at the refiners, out of which they had taken all the gold before; this did amalgamate very easily; then I strained it to a ball through a leather skin, and so mixed it with the yellow sublimate that was tinted yellow with the tincture of iron and copper. The proportion of the quicksilver to the silver was five or six parts to one. If any one doubt the truth of alchemy, he may be satisfied by this trial; but instead of gain, he shall pay for his learning by going away with loss. But if any one will uphold me as good a lease, or purchase of land, as I can prove by credible records hath been had in former times, for an ounce of gold, I will undertake to make an ounce of gold, not having more pay for it, yet have a good bargain."

**MANUFACTURE OF IRON BY THE BISCAYAN FORGE.**—The Biscayan forge can only be used in countries where wood is cheap and abundant; it is somewhat similar to the Catalan forge, of which it is a variety. The tuyère is placed about  $9\frac{1}{2}$  inches above the bottom. The hearth is lined with a layer of charcoal dust and loam, worked together, and the ore, after being roasted, is sifted—the small powder being set aside to be used in the course of the operation. The ore is piled up on the side opposite to the blast, in a sharp saddle ridge, and it occupies one-third of the furnace. In the remaining space of two-thirds, the charcoal is put, to solidify the small ore on the hearth—it is covered with moist cinders, mixed with clay. The fire is urged with moderation during the first two hours—the workmen being employed in pressing down more charcoal as the former supply burns away, so as to keep the space full, and prevent the ore from crumbling down. After two hours, the full force of air is given, at which period the fusion ought to commence. It is easy to see whether the torrefication be sufficiently advanced, by the state of the flame and appearance of the ore; the workman now completes the fusion by detaching the pieces of ore from the bottom, and placing them in front of the tuyère. When fine siftings are thrown on the top, they must be watered, to prevent their being blown away, and to keep them evenly spread over the whole surface of the light fuel—they increase the quantity of the products, and give a proper fusibility to the slag. When the slag is viscid, the quantity of siftings must be diminished—if thin, they must be increased. The excess of slag is allowed to run off by the *chio*, or floss-hole. The process lasts from five to six hours, after which the pasty mass is taken out and placed under the hammer, to be cut into lumps, which are afterwards forged into bars. Each mass presents a mixed variety of iron and steel, in proportions which may be modified at will; by using much of the siftings, and making the tuyère dip towards the sole of the hearth, iron will be the chief product; if the operation be conducted slowly with a small quantity of siftings, and an upraised tuyère, the product of steel is more considerable. The weight of the lump of metal will vary from 200 lbs. to 400 lbs.

**MANUFACTURE OF IRON IN SCANDINAVIA.**—There are several works established in Scandinavia, which deliver very good rough castings. The pig-iron is exported from Glasgow, and the fuel used is English coke. Although the peninsula abounds with iron, yet the roads are so bad, and consequently the transport so expensive, that it can be produced in the sea-port towns at a much lower rate than at the mines, notwithstanding the freight,



insurance, duty, and other charges the importer has to pay. The greatest quantity of the iron produced there is exported to North America, where it realizes from \$80 to \$100 per ton. The famous Swedish iron produced at Danemora, and which makes the best cutlery, is shipped to Hull—a large mercantile firm there having had the contract for several years of their produce. The iron trade is regulated in Sweden by the government: in order that the poorer mines should not be abandoned, the richer are obliged to diminish their produce—so that the market may not be overstocked, nor are they allowed to sell at a lower rate than fixed by the committee of the “Jern Värks Contoir.”

**TORREIFICATION OF COBALT IN SAXONY.**—The ores of cobalt are torrefied in Saxony in furnaces; the arsenical vapours, attaching themselves to the sides, yield the arsenic of commerce. When the oxide of cobalt is cleaned of arsenic, it is known by the name of “zaffre.” The zaffre of commerce is mixed with three-fourths of sand. This oxide, fused with three parts of sand and one of potash, forms a blue glass, which, when pounded, sifted, &c., forms smalt. The most simple way of obtaining cobalt in its metallic state is to reduce it from smalt, by fusing one part of smalt with six of soda.

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## MINES.

**MINING LAWS OF ATHENS.**—The most considerable mines belonging to the Athenians were the silver-mines of Laurion, from the proceeds of which Themistocles first raised the naval power of Athens to a state of efficiency. These mines extended from coast to coast, in a line of about seven English miles from Anaphlystus to Thoricus. The working of them appears to have been very productive in the time of Themistocles, less profitable in that of Socrates and Xenophon, and before that of Strabo they were exhausted. The ores contained silver and lead with zinc, and probably copper. At Thoricus, spurious emeralds occurred in combination with the ore; cinnabar was also found there. The mines were worked by shafts and adits. The process of fusion carried on in the furnaces appears to have been the same as that employed in other mines. The State was the sole proprietor of the mines, but they were never worked at the public expense, nor did the State ever let them for a term of years, like other landed property. They were always granted to private individuals in fee-farm, and these leases were transferred from one to another by inheritance, sale, and other kinds of legal conveyance. The sale of the mines, or rather the right to work them, was managed by the *poletæ*, and this right was purchased at an appointed price, in addition to which, the possessor paid the 24th part of the net produce as a perpetual tax. The purchase-money was paid directly to the State, but the contingent rents were probably let to a farmer-general. There was a mining law, and a particular course of legal proceeding in cases relating to mines, which, for the greater encouragement of the proprietors of mines, were, in the time of Demosthenes, annexed to the monthly suits. The mines were also free from property taxes, and did not subject the possessor to the performance of liturgies.

**GOLD IN FRANCE.**—This metal has been found in France, although in exceeding small quantities. In the year 1781, a vein was discovered at Gardette, in the valley of Oysans, department of the Isère. This vein consisted of quartz, which traverses a gneiss mountain, and contained auriferous sulphuret of iron, besides some specimens of native gold, but the



quantity obtained was found insufficient to repay the expense of operations. Many of the rivers, as the Rhone, the Rhine, the Garonne, and others of smaller note, furnish auriferous sand. Veins of auriferous sulphuret of iron, traversing gneiss rocks, have been discovered at the foot of Mount Rosa, in Piedmont; and the sands of some of the rivers, and various parts of the soil, on the south side of the Apennine mountains, are likewise auriferous.

**SILVER-MINES IN FRANCE.**—These are not of any great importance. The mine of Allemont, in the department of the Isère, is situated near the summit of a lofty mountain, composed of beds of gneiss and primitive limestone, inclined in different angles to the west. The veins are numerous, and run in all directions. The ores are native silver, sulphuret of silver, red silver, and a small quantity of muriate of silver. They are accompanied by different ores of cobalt, antimony, and nickel; the matrix is usually clay mixed with iron, calcarious spar mixed with asbestos, and other earthy minerals. Indications of silver have also been observed in the Vosges, where, in a vein of grey copper ore, has been found a certain proportion of this precious metal.

**COPPER-MINE OF FRANCE.**—The only copper-mine in France is at Chessy, near Lyons. It is but partially worked, the production was never of any great extent; its greatest celebrity was derived from the beautiful specimens of blue and green carbonates which were obtained from it. The furnaces used there are the half-high German furnaces; they are of a very high antiquated construction, and are now nearly everywhere exploded.

**LEAD-MINES IN FRANCE.**—The most considerable are those of Poul-louen and Huelgoet, in the department of Finisterre, which have been worked into two parallel veins, included in primitive rocks. There are also deposits of lead in the Vosges, where the galena is disseminated in a thick vein of decomposed granite, in the department of Sambre and Meuse, where the veins traverse limestone nearly in a vertical position, and in other places, where, in their distributions and productions, the mines are analogous to those of Great Britain. The produce of the French mines is about 30,000 quintals of lead annually.

**ANTIQUITY OF THE MINES OF ALMADEN.**—The most ancient mine of quicksilver known in the world is that of Almaden, in Spain. According to Pliny, it was wrought 500 years before the commencement of the common era; and in his time 10,000 lbs. of cinnabar were transported to Rome for the purpose of being employed in painting. This celebrated mine, or rather cluster of mines, is situated in a branch of the Sierra Morena, upon the confines of Andalusia, about 15 leagues to the north of Seville. The hill which contains it is about 1,000 fathoms in length, 600 in breadth, and 120 in height. It is composed of the same materials as the neighbouring mountains, which consist of sandstone, and its surface exhibits two inclined planes, which, uniting at the summit, form a crest of rock that is entirely bare, and spotted with sulphuret of mercury.

**GOLD-MINES IN SPAIN.**—There are several auriferous lodes in Spain. A mine called Domingo Florès, situate at Medal, in the kingdom of Leon, was worked by royal concession, from May 11, 1639, to June 26, 1644, and afterwards from 1733 to 1749, at which period it was abandoned, in consequence of the interdiction issued by the Government to stop the working of mines in Spain, in order to direct the attention of the metallurgists to those of America.

**MINES OF GALICIA.**—The province of Galicia is said formerly to have been celebrated for rich mines of gold and silver: its metallic productions at present are confined to lead, copper, and tin. Between Corunna and Betanzos there are quarries of jasper and white marble, and in the other places there are found marcassite, vitriol, and sulphur. There are many

hot springs in the country. One part of the town of Orense, in consequence of the number of these thermal waters, which warm the air by their vapours, enjoys all the mildness of spring while the opposite part is experiencing all the rigours of winter. The deposits of tin in Galicia have not as yet been worked. There are lead, silver, copper, and coal mines in several of the Spanish districts. Coal exists in Portugal in the provinces north of the Douro; but the inertness of the resident hidalgos, and the unsettled habits of the population, have rendered them careless of its value.

**MINING SCHOOLS IN GERMANY.**—The most celebrated are those of Freiberg, in Saxony, and Clausthal, in the Hartz district, in Hanover. Lectures are delivered in both these colleges, on practical chemistry, assaying, mining, mechanics, mathematics, geology, and mineralogy, by able professors, who are appointed by Government. Permission is given to the students to manipulate in the laboratory, and free access is granted to all the mines. Diplomas are given on passing examination, but it is not customary to appoint foreigners to any situation in the mines or smelting works. Living is very cheap in both districts, and the fees required would be trifling in comparison with those necessary in England; but a correct knowledge of the German language is indispensably requisite in order to render all the advantages afforded by these institutions available.

**COAL IN NEW SOUTH WALES.**—The total extent of the coal tract in the vicinity of Newcastle, Port Hunter, has not been ascertained; but the sales by the Australian Agricultural Company, in 1840, amounted to 20,000 tons. In 1845, the company had usually 10,000 tons ready on hand, the price being 11s. per ton, delivered at the works, and at Sidney 22s. per ton. The sales in 1847 amounted to 40,000 tons. The monopoly by the company having been surrendered in 1847, several works have since been opened by private speculators, and a seam of ten feet in thickness has recently been discovered within two miles of the place of shipment, so that the company are now enabled to meet a demand of 300 to 400 tons per day, if required. There is no reason, therefore, to apprehend any deficiency of supply for the use of steamers upon this coast; and it is even supposed that the copper of South Australia might be smelted near Port Hunter with advantage, as vessels of 300 or 400 tons can lie in the port of Newcastle in perfect safety, under the end of the coal-slips.

**ANTIQUITY OF THE DIVINING ROD.**—The use of the divining rod is of considerable antiquity, both in Spain and Germany. It was first introduced into England in the reign of Queen Anne, by a renegade Spaniard, of the name of Riberia.

**GOVERNMENT INSPECTION OF MINES IN SAXONY.**—All the mines and manufactories of metals in this country, whether public or private, are subject to Government superintendence. The principal inspector, who ranks with a general officer, is styled the Ober Berg Hauptmand. Under him are various officials, of different grades, in the several departments of mining, smelting, and manufacturing; these report quarterly to him the various occurrences which have passed in their districts. A condensation of this is embodied in the form of an annual report, and transmitted to the Minister of Finance, who is considered the supreme chief of this branch of national industry.

**IRON-MINES OF ELBA.**—The island of Elba possesses one of the richest iron-mines in the world. Its existence appears to have been known from the earliest times. The ore is chiefly of the specular kind, and the mass constitutes an entire mountain, which is surrounded by others consisting of granite, of which the island is almost wholly composed. The mountain, which is called Rio, is about 500 feet in height, and three miles in circumference, and its surface is covered with a reddish ochry earth, which in some places is several feet in thickness, and full of small shining scales of

iron ore. Beneath this covering, the mass of the mountain consists of metallic ore, or rather accumulated masses, thrown together without any order of stratification. These masses are deposited in an ochry substance, which may be considered as their matrix; and besides the specular ore, which preponderates, other varieties are occasionally met with. The iron-mines of Elba were wrought in the time of the Romans, by means of excavations carried into the mountain; but now the ore is extracted by the ordinary process of quarrying. It has been conjectured by some, that the mass of iron ore in the island of Elba is part of a great vein, of immense extent, running into the adjacent continent.

**SILVER IN SCOTLAND.**—Great quantities of silver have been, at different times, found in England. Mines of this metal were said to exist in Sutherland. In Sir Robert Gowlen's "History of the Earls of Sutherland," he thus mentions them:—"In Southerland there are silver mynes which have been hithertoo neglected. Their was ane essay of these mynes carried to London the yeir of God 1620 by the deceast Sir Thomas Menzies, and being tryed in England, they were verie rich. But he concealing in what part of Southerland the same was found, and dying upon the way at that tyme in return from London towards Skotland, the state is hithertoo deprieved of the benefit of these mynes, until it shall please God in his appoynted tyme to discover the same."

**SALT-WORKS OF POLAND AND HUNGARY.**—Those of Poland are at Vilitzca, near Cracow; the Hungarian are at Saltzburg, in Upper Hungary. The rock-salt produced there is of different colours; the blue and red variety always loses its colour when exposed to the air, while the yellow retains it. At Neusol, there is a statue of rock-salt which acts as a barometer; it grows moist when there is an appearance of rain, but it is always dry when the weather is settled, or likely to become fair.

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## ELECTRICITY.

**EARLY DISCOVERY OF ELECTRICITY.**—The first discoverer of electricity is said to have been Thales, of Miletus, who flourished about 600 years before the Christian era. He is reported by subsequent writers to have described the power developed in amber by friction, by which it was enabled to attract bits of straw, and other light bodies, and an attempted explanation of this phenomenon is given in one of his philosophical dogmas.

**CONSTRUCTION OF THE VOLTAIC BATTERY.**—Raise a pile, by placing a plate of zinc, a piece of card or woollen cloth, and a plate of silver, on each other; then a second piece of zinc, &c., successively, until the elevation is at some height, for the effects are greater in proportion to its height; immerse the pile in acidulated liquid; then touch both ends of the pile, at the same instant, with one piece of iron wire, which runs through holes in the centre of each plate. On contact, a spark is excited from the extremities of the pile, and luminous points are often perceived at different heights, where the zinc and silver come into mutual contact. The zinc end of this pile appears to be negatively electrified; that formed by the silver, on the contrary, indicates marks of positive electricity. If both extremities of the pile are touched, after the hands are dipped in water, or a saline solution, a disagreeable pricking in the fingers and elbow is felt. If there is placed in a tube, filled with water, and hermetically closed by two corks, two wires which are in contact at the other extremity—one with the summit, the other with the base of the pile—these ends, even when separated



only by the space of a few lines, experience. evident changes at the instant the extremities of the pile are touched. The wire in contact with the part of the pile composed of silver becomes covered with bubbles of hydrogen gas; that which touches the extremity formed by zinc becomes oxydized, or gives off oxygen gas. Fourcroy attributes this phenomenon to the decomposition of water by the galvanic fluid, which abandons the oxygen to the metal that touches the positive extremity of the pile, then conducts the other gas invisibly to the end of the other wire, there to be disengaged.

**USES OF ZINC IN ELECTRICITY.**—Zinc and iron produce a more copious current than even zinc and silver, or zinc and platinum, both in dilute sulphuric and dilute nitric acid. The plates of the zinc and the platinum pair must have a surface three times as great as that of the zinc and iron to yield the same quantity of electricity; but the intensity of the current excited by zinc and iron is smaller. If the quantity of electricity yielded by zinc and iron be 260, that by zinc and copper is 100. When the plates are connected by a wire 50 feet long, the yield by zinc and iron is 33.7, and by zinc and copper 18. The resistance of the long wires diminishes, therefore, the quantity yielded by the zinc and iron from 100 to 13, and by zinc and copper from 100 to 18. When the plates are connected by a fine wire 2,000 feet long, the quantity of electricity yielded by zinc and iron is to that furnished by the zinc and copper as 1,000 is to 1,678. With amalgamated iron zinc yields a much feebler current than with common iron. Gottling constructed a powerful pile with plates of iron covered with zinc on one side, and moistened pieces of cloth. Zinc, either common or amalgamated, is almost always used as the positive metal of the battery, but since common zinc is subject to ordinary chemical action, and likewise, on account of alloys mixed with it, to local galvanic action, and since these actions continue even when the circuit is open, a great deal of zinc and acid is uselessly consumed. By the use of amalgamated zinc, first introduced by Sturgeon, this loss is avoided. With this kind of zinc, however, the current is soon reduced to 1-8th or 1-10th of its original strength, because no gas is evolved on the zinc, and, consequently, the acid does not get well mixed; but, on breaking contact for a while, the current regains its former power. Rolled zinc plates are preferable to those of cast zinc, which are less pure. New plates act better than such as have been used two or three times, perhaps because the alloys come out more prominently as the surface dissolves, and thus give rise to local galvanic action. This deterioration of zinc plates by use soon reaches its limit in the case of rolled zinc, but with cast plates it goes on continually. The more smoothly the plates are rubbed, the better they work. For the negative metal, copper, iron, lead, silver, platinized silver, platinum, graphite, or peroxide of lead, may be used.

**GROVES' GAS BATTERY.**—This consists of a series of tubes, containing slips of platina foil, covered with a pulverulent deposit of the same metal. The tubes are arranged in pairs, in separate vessels of dilute sulphuric acid; and of each pair one tube is charged with oxygen, and the other with hydrogen gas, in quantities such as to allow the platina to project above the dilute acid into the atmosphere of gas in the upper part of the tube. The platina in the oxygen of one pair is metallically connected with the platina in the hydrogen of the next; thus a series may be composed of any number of pairs. A battery of four cells, constructed in this manner, will decompose acidulated water; a single cell will decompose iodide of potassium, and 20 pairs will produce very powerful effects—such as giving a shock which may be felt by several persons at once—producing a brilliant light between charcoal points, &c. When the poles are unconnected, a gold leaf electroscope, connected with either of them, is sensibly deflected. When distilled water is substituted for acidulated water in the cells of the battery, the effects are similar, but more feeble.



**SPENCER'S APPARATUS FOR ELECTROTYPING.**—A cylinder of glass, wood, or glazed earthenware (having a rim at the bottom for retaining the gypsum), is closed at the lower end with a diaphragm, three-fourths of an inch thick. It contains zinc, immersed in a solution of common salt, and is itself surrounded by a solution of sulphate of copper, which contains the body to be coppered. The operation succeeds best when the surface to be coppered is of the same size as the zinc surface, and that of the gypsum greater than either. The zinc is frequently cleansed, and the salt solution occasionally renewed. When the process is continued for some time, the copper solution must likewise be renewed, otherwise the sulphuric acid which is set free prevents the precipitated copper from assuming a solid consistence, and converts it into a brown-red powder; in such a case the copper must be cleaned with very dilute nitric acid. The formation of a layer of copper, one-eighth of an inch thick, takes eight or ten days.

**ELECTRICAL BELLS.**—These are used in a variety of entertaining experiments by electricians. The apparatus, which is originally of German invention, consists of three small bells suspended from a narrow plate of metal, the two outermost by chains, and that in the middle, from which a chain passes to the floor, by a silken string. Two small knobs of brass are also suspended by silken strings, one on each side of the bell in the middle, which serve for clappers. When this apparatus is connected with an electrified conductor, the outermost bells, suspended by the chains, will be charged, attract the clappers, and be struck by them. The clappers becoming electrified, will likewise be repelled by these bells, and attracted by the middle bell, and discharge themselves upon it by means of the chain extending to the floor; after this they will again be attracted by the outermost bells, and thus, by striking the bells alternately, occasion a ringing which may be continued at pleasure. Flashes of light will be seen in the dark between the bells and clappers, and if the electrification be strong, the discharge will be made without actual contact, and the ringing will cease. An apparatus of this kind, connected with one of those conductors which are erected for protecting buildings from lightning, will serve to give notice of the approach and passage of an electrical cloud.

**GILDING AND PLATINIZING.**—Bottger makes use of the following apparatus for gilding and platinizing. A wide cylinder has a hole in the middle of its base, through which there passes a copper wire, cemented in with sealing-wax. The part of the wire within the cylinder is formed into a flat spiral, upon which is laid a piece of amalgamated zinc. The cylinder contains very dilute sulphuric acid; in this is immersed a cylinder, open at the top and bottom, but tied over at the bottom with a thin bladder. The cylinder contains solution of gold, in which the metal to be gilt is immersed, after it has been first connected, by means of a platinum wire wound round it, with the copper wire proceeding from the zinc. The gold solution contains one part of chloride of gold, freed as much as possible from excess of acid, in 160 parts of water, or, still better, chloride of gold and sodium dissolved in water. Each immersion lasts for a minute at the utmost, and is followed by washing with water, and drying (accompanied by brisk rubbing with fine linen) and polishing with powdered chalk. Silver requires five or six, steel ten or twelve, immersions, lasting from half a minute to a minute. When the silver object is connected with the zinc by a copper wire, part of which dips into the solution of gold, the gilding acquires a strong reddish tint; whereas, when silver or platinum wires are used, it is of a full bright yellow. If the gold solution contains the smallest trace of copper, scarcely anything but copper is at first deposited upon the silver. Copper also does not show any appearance of gilding, for some time, because the red colour of the metal shines through. Brass may be gilt almost as well as silver; tin not so well. German silver gives a coppery

kind of gilding, not very beautiful. Watch springs take a very beautiful gilding when they are freed by hydrochloric acid from the blue film of oxide. On long knives the gilding is not uniform, being thickest at the end next the zinc. Steel, which is to be gilt, must be highly polished without oil; that which has been polished with oil does not take the gold, for it retains particles of oil closely attached to its surface, so that it is scarcely attached by strong hydrochloric acid.

**ELECTRIC LIGHT.**—This magnificent light may be shown by a small battery; a piece of charcoal or coke is attached to the ends of the wires in connection with the positive and negative poles, and when brought into contact, and thus completing the galvanic circuit, the carbon points immediately become incandescent, giving out a brilliant and dazzling light. Although not in actual combustion, the charcoal or coke is constantly undergoing gradual abrasion at one pole, while an accumulation is taking place at the other; and as the distance between the two lengthens, the light becomes less and less brilliant, and at length disappears. It is the difficulty of obtaining the carbon of a perfectly clear, solid, and homogeneous nature, and of devising some simple and self-acting plan by which, as the distance is increased, they should be pressed forward to their proper position, and thus keep up the brilliancy and regularity of the light, which has hitherto baffled the patentees in their endeavours to render this beautiful light available for public illumination or domestic purposes. Perhaps the greatest of all the difficulties lies in the fact, that *one light* only can be obtained from one galvanic circuit.

**ELECTRICAL AND CHEMICAL APPARATUS CEMENT.**—Mr. Singer's consists of 5 lbs. resin, 1 of bees'-wax, 1 of red ochre, and two table spoonfuls of plaster of Paris, all melted together. A cheaper one, for cementing voltaic plates into wooden troughs, is made with 6 lbs. of resin, 1 lb. of red ochre,  $\frac{1}{2}$  lb. of plaster of Paris, and  $\frac{1}{4}$  lb. of linseed oil. The ochre and plaster of Paris should be previously calcined, and added to the other ingredients in their melted state. The thicker the stratum of cement that is interposed, the stronger, generally speaking, is the junction.

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## MISCELLANEA.

**EARLY ASSURANCE COMPANIES.**—The first system was that of Tontines, invented by Laurence Tonti, a Neapolitan, in 1653. The plan was this:—A certain number of persons clubbed together a specific sum annually, without reference to age or sex; at the expiration of each year the interest was divided amongst the subscribers who were living, and so on from year to year, until the last survivor received the whole of the interest. In 1689, the last survivor of a tontine in France was a widow, who, at the period of her death, at the age of ninety-six, enjoyed an income of 73,500 livres (£3,062. 10s.) for her original subscription of 300 livres (£12. 10s.) The first assurance company founded in England was the Amicable, in 1707; the next were, the London Union, 1714; the Royal Exchange, 1720; and the London Assurance, 1721. There are at present above 130 insurance offices in Great Britain and Ireland, which have an established name. In 1831, the value of insured property was something above £526,000,000. In 1841 it amounted to £682,000,000, being about an increase of thirty per cent. in ten years, and since then it has increased in equal proportion.

**INCORPORATION OF THE EAST-INDIA COMPANY.**—This association was first incorporated by Queen Elizabeth, A.D. 1600, under the title of

“The London Company of Merchants trading to the East Indies for the purpose of extending the commerce and navigation of their country in the seas and among the islands and continents east of the Cape of Good Hope.” They enjoyed the monopoly precisely 100 years, at the expiration of which period a second company arose, which, like the first, obtained a charter, and between which and the old company a rivalry, at once mischievous to themselves, and, as it was then believed, hurtful to the mother country, arose. William III., who incorporated the latter body, interfered to put a stop to this state of things. The two firms were persuaded to come to an understanding with one another, and a new charter raised them into a corporate body, which still exists as “The United Company of Merchants of England trading to the East Indies.”

**INTRODUCTION OF STEAM NAVIGATION IN GREAT BRITAIN.**—Steam-boats commenced plying on the Clyde in 1812. The first was seen on the Thames in 1815. A steamer arrived in Liverpool from New York in 1819; and in 1825 the first steam voyage was made to India.

**INVENTION OF THE CHRONOMETER.**—The first inventor of the chronometer was John Harrison, the son of a poor carpenter in Yorkshire. For this invention, in the year 1759, he received a premium of £20,000 from the Government. He had been studying how he could alter a clock, so as not to be subject to any irregularities from the motion of the ship or the difference of climate, from the end of the reign of Queen Anne until he brought it to perfection, having occupied forty-five years in its unremitting study.

**LOCALITIES OF FULLER’S-EARTH.**—Great quantities of fuller’s-earth round about Nutfield, Reigate, and Bletchingley, to the south of the Downs, but of inferior quality, near Sutton and Croydon, to the north of them. The most considerable pits are near Nutfield, between which place and Reigate it lies so near the surface as to be turned up by the wheels of the waggons. It is not known how long this earth has been wrought in Surrey; the oldest pit now wrought is said to have lasted between seventy and eighty years, but is fast wearing out. The seam of fuller’s-earth dips in different directions. There are two kinds of it, the blue and the yellow; the former on the eastern side of the pit, between Redhill and Nutfield, is frequently within a yard of the surface, being covered merely with the soil, a tough, wet, clayey loam. A few yards to the west, the blue kind appears, with an iron sandstone, of nearly two yards in thickness, between it and the soil. The blue earth in this pit is nearly sixteen feet deep. In some places the yellow kind is found lying on the blue. There does not appear to be any regularity, either in the position or inclination of the strata where the fuller’s-earth is found, nor any mark by which its presence could be detected; it seems rather thrown in patches, than in any continued or regular vein. In the midst of the fuller’s-earth are found large pieces of stone of a yellow colour, translucent, and remarkably heavy, which have been found to be sulphate of barytes, encrusted with quartzose crystals. These are carefully removed from the fuller’s-earth, as the workmen say they often spoil many tons of it which lies about them. There is also found with the yellow fuller’s-earth a dark brown crust, which the workmen consider also as injurious. In Surrey the price of fuller’s-earth seems to have varied but little: in 1730 the price at the pit was 6s. a sack, and 6s. load, or ton. In 1644 it was nearly the same. It is carried from the pits on tram-roads to Westham, along which it is taken to the banks of the Thames, where it is sold at the different wharfs. It is thence shipped off either to the north or west of England. A considerable quantity is also taken down into Wiltshire by the waggons, especially when they have not a full load.

**ANTIQUITY OF COAL-MINES.**—Newcastle obtained the first charter



on record to dig for coals; this was in 1239, and in 1281 the export was considerable. A cubic foot of coal, of average quality, weighs from 75 lbs. to 80 lbs.; and an acre, two feet thick, will yield 3,000 tons, and five feet thick, 8,000 tons.

**COMPOSITION OF WINDOW GLASS.**—Common window glass is composed of soapboilers' waste six bushels, kelp three ditto, sand four ditto. When these materials have been calcined for from twenty to thirty hours, they are removed with iron shovels, while red hot, to the melting-furnace, where the pots are filled with it. By exposure to the heat twelve or fifteen hours, the whole is reduced to a fluid state. It is then taken out upon tubes, and blown into globes of nearly a foot in diameter. These globes being carried to the mouth of the oven, a longitudinal and nearly rectilineal crack is produced by touching it with cold iron, dipped in water. The globe is then opened on a smooth iron plate at the mouth of the furnace, and then forms a circular sheet of thin transparent window glass.

**SILVERING OF MIRRORS.**—This is performed by a mixture of tin and mercury, which combine in definite proportions and crystallize on the glass. The date of the discovery is uncertain, but, according to the best evidence, it proceeded out of Venice at a period when the alchemists were busy with metals, in the wild expectation to transmute them into gold. In searching for a chimera, they lighted upon a beautiful domestic invention. The Roman and Grecian mirrors were of tin or polished steel.

**SKERRYVORE LIGHT-HOUSE.**—This building is 120 feet high, the base is forty-two feet, and the top sixteen feet. The first stone of it was laid July 7, 1839, by the Duke of Argyll. The architect and engineer who built it is Mr. A. Stevenson, whose father erected the Bell Rock Light-house. The light was first exhibited Feb. 1, 1844. The foundation pit, which is in gneiss, is forty-two feet deep; to excavate this it required the labour of twenty men for 277 days, the firing of 296 shots, and the removal into deep water of 2,000 tons of material. Eddystone Light-house was built in 1696; Mr. Winstanley, the architect, perished in a storm there, a short period after it was erected.

**ANTIQUITY OF THE USE OF GUANO AS A MANURE.**—The introduction of guano, though comparatively of recent date in England, has long been known to the Spaniards. It is thus mentioned in a treatise by Dr. Alvaro Alosono Barba, director of the mines of Potosi, translated by the Earl of Sandwich, 1669:—"Out of the islands in the South Sea, not far from the city of Arica, they fetch earth which manures the fields. It is called guano (*i. e.* dung—not because it is the dung of sea-fowls, as many would have it understood, but because of its admirable quality in making ploughed ground fertile. It is light and spongy; and that which is brought from the island of Iqueyque is of a dark grey colour, like unto tobacco ground small. From other islands, near Arica, they get a white earth, inclining to a sallow, of the same virtue. It instantly colours waters whereunto it is put, as if it were the best lye, and smells very strong. The qualities and virtues of this, and of many other simples of the New World, are a large field for ingenious persons to discourse philosophically upon, when they shall bend their minds more to the searching out of truth than riches."

**INTRODUCTION OF GAS.**—The earliest application of gas light on a large systematic scale was made at Manchester, where an apparatus for lighting the great cotton-mills of Messrs. Phillips and Lee was fitted up in the years 1804 and 1805, under the direction of Mr. Murdoch. A quantity of light nearly equal to 3,000 candles was produced on this occasion.

**TRAFFIC OF THE GRAND JUNCTION CANAL.**—According to statistical accounts which have been published, the goods traffic on the Grand Junction Canal has much increased since the opening of the London



and North-Western Railway. The quantity carried in 1847 amounted to 1,163,466 tons; the average annual amount of goods carried the twelve years subsequent to 1836 was 1,039,333 tons, while three years prior to 1836, before the line was opened, but 756,894 tons were moved on the canal. The dividends received by the Grand Junction Canal for the last forty years have averaged £9. 10s. 9d. per cent. per annum.

**ANCIENT CLOCK.**—The earliest clock with a balance of which we have any distinct account was made by Henry de Wyck, or De Vick, a German artist, for Charles V., king of France, and set up in the tower of his palace, about the year 1364.

**SIMPLE METHOD OF EXTINGUISHING FIRE.**—Mr. Cadet Vaux says, the best method of extinguishing a fire in a chimney is by throwing on the coals in the grate some flour of sulphur, which, combining with the oxygen, forms sulphurous acid, and being a non-supporter of combustion, as it passes up the chimney puts out the fire.

**LARGE BELLS.**—Bells were first introduced about A.D. 400, at Nola, in Campania—hence the term “Campanology” has been applied to the art of bell-ringing. The largest bell that was ever founded is that of Moscow. It has never been suspended, but lies in a deep pit at the Kremlin. The circumference is 67 feet  $3\frac{1}{2}$  inches, and the height 21 feet  $4\frac{1}{2}$  inches, and the thickness, at the thickest part, 23 inches; its weight has been computed at 443,772 lbs., which, at the rate of 2s. 6d. per lb., will amount to the sum of £55,471. 10s. lying unemployed, and of use to no one. It was cast at the expense of the Empress Anne, in the year 1735. In England the largest bells are those at Christ Church College, Oxford, which weighs 17,000 lbs.; St. Paul's, London, 11,474 lbs.; and the “Great Tom,” of Lincoln, 10,954 lbs.

**OLD SUSPENSION BRIDGE.**—One of the first suspension bridges was built over the river Tees, in 1741, to form a communication between the counties of Durham and York. Hutchinson thus describes it, in his *Antiquities of Durham*:—“There is a bridge suspended on iron chains, stretched from rock to rock, over a chasm near sixty feet deep, for the passage of travellers, principally miners. The bridge is seventy feet in length, and little more than two feet broad, with a hand-rail on one side, and planked in such a manner that the traveller experiences all the tremulous motion of the chain, and sees himself suspended over a roaring gulf, on an agitated and restless gangway, to which few strangers dare trust themselves.”

**VARIATION IN THE WEIGHT OF LEAD.**—The fodder of lead varies in different localities. In Derbyshire the fodder of lead consists of 23½ long cwts. of 120 lbs., or 2,820 lbs. In shipping it in vessels on the Trent, it is put on board by the fodder of 2,408 lbs.; the invoice is made after that. On the arrival in the Thames, the fodder is weighed at 2,184 lbs. For the Hull market it is reckoned at 2,340 lbs. The customs duties are invariably payable on the fodder of 2,240 lbs.

**INVENTION OF THE COINING-PRESS.**—The coining-press, or mill, is of French origin, and is generally ascribed to Antoine Broucheur, an engraver, who, in 1533, first tried it in the French king's (Henry II.) palace, for the coining of counters. It continued in use till 1585, in the reign of Henry III., when it was laid aside, on account of its being more expensive than the hammer coinage. It remained in disuse until 1623, when Briot, a French artist, unable to persuade the French Government to adopt it, came over to England. It was not, however, finally brought into use before 1662; previous to that period, the money in circulation was made by forging or hammering slips of gold and silver to the proper degree of thickness, then cutting a square from the slip, which was afterwards rounded, and adjusted to the weight of the money to be made; after which the blank

pieces of money were placed between two dies, containing the design of the coin, and the upper one was struck with the hammer. The money was necessarily imperfect, from the difficulty of placing the two dies exactly over each other when the blank piece was between them, as well from the improbability of a man being able to strike a blow with such force as to make all parts of the impression equally perfect.

**DUTCH MANUFACTURE OF FALSE GOLD-LEAF.**—This is made of brass, covered with gold. The brass is reduced to a fine thin riband by laminating, in the same manner as the gold. The riband is then gilded by the wash-gilding process, and afterwards cut into pieces, which are beat into leaves by the same means as are used for gold-beating, but the extension is not carried so far, because there is the less inducement to make the leaves thin. It is difficult to distinguish this from true gold when new, but it very soon tarnishes, and wholly loses its colour, which renders it unfit for any other kinds of gilding than those which are to be varnished over.

**BOILING SPRINGS OF THE GEYSIR, IN ICELAND.**—In a plain, about eight miles in breadth, extending from the foot of the Blafell to the seashore, and connecting itself with the flat moorland of the coast, lie the springs of the Great Geysir, at the foot of a hill, composed of slaty phonolite and grey trachyte. According to all appearance, this plain, which has scarcely a perceptible inclination to the sea, was once a broad fiord, reaching as far as the jagged mountains of the Yarlhettur and the Blafellsbals. It is clothed with a thick green carpet of meadow-ground, and many larger or smaller springs wind like silver ribands through the grass, sometimes hiding between high banks, then again coming in sight. To the east and south-east are seen ranges of flat hills and mountains, among which can be distinguished the cone of Hecla; on the opposite side, behind the Laugafell, the Byrnafell, higher and steeper, and mostly veiled in dark blue clouds, clothed at its foot with grass, but at the summit showing naked crags, on which lie bare strata of trap-rock and palagonite. From a considerable distance the traveller perceives, at the foot of the Laugafell, light clouds of steam rising out of the ground, or sometimes thick columns of smoke whirling upwards in the air; but he soon finds himself in the midst of a complicated system of boiling springs, which break forth from a volcanic chasin, extending in the direction of north-north-west. The valley of the Geysir is mostly filled with a new alluvium, which has here and there undergone a subsequent elevation, extending northwards from the spring in a broad ridge. Through this soil, which has been gradually overlaid by a thick stratum of *kieselsinter*, the deposit from the springs, the Geysir bursts forth, and from the horizontal beds of this deposit there has formed, in various proportions round the Geysir and smaller fountains, a flattened cone, in the midst of which is a perpendicular cylindrical funnel, of larger and smaller diameter. In ordinary circumstances, the basin of the Geysir is filled with crystal-clear sea-green water, of the temperature of 82° (centigrade), and it flows in three small channels over the eastern slope of the cone. After some time, a sound, as of subterranean thunder, can be distinguished, resembling that made by a volcano during an eruption, and then a slight tremulous motion may be perceived on the rim of the fountain. When this has lasted some seconds, it ceases, perhaps for a time, and then begins again with increased force; the water in the basin begins to swell, and the surface becomes convex, and at the same time great bubbles of steam rise to the surface, and burst, throwing up the boiling water some feet high. Then it is again still, and the whole fountain is enveloped in clouds of steam. This phenomenon is repeated at regularly-recurring intervals of an hour and twenty minutes to an hour and a half—perhaps for a day—until it suddenly assumes a different character. A heavier thunder is heard below; the water swells violently, and

begins to heave and dash in the strongest agitation; and, after a few minutes, there shoots up a column of water, dispersing at the summit into dazzling white foam; this has scarcely reached a height of from eighty to a hundred feet, when, before its drops have had time to fall to the ground, a second and third follow, and rise still higher. Larger and smaller jets now shoot forth in all directions, some sideways in arches, others perpendicularly upwards, with a loud hiss, like that of a rocket—enormous clouds of steam roll upwards; then comes a loud detonation from below, followed by another column of water higher than any of the preceding ones, and mingled with stones; and after the phenomenon has lasted for a few minutes, the whole falls, and vanishes like the fantastic pageantry of a dream. Before the clouds of steam have had time to disperse, or the boiling water to run off the sides of the cone, the basin, which had seemed full to the brim, appears almost dry, the water having sunk nearly three feet.

**INCREASE OF COAL CONSUMPTION IN LONDON.**—The records of the London Custom-house having been destroyed by fire, it is impossible to obtain many of the statistical details of trade; but it happens that the writer of a history of London, above 100 years ago, obtained from the Custom-house, at that time, an account of seven years' importations of coal into London. The preservation of this account enables us to give the following comparative statement of the importations into London for a period of above 100 years:—

YEARS.	TONS.	YEARS.	TONS.
1726 . . . . .	632,470	1826 . . . . .	2,103,498
1727 . . . . .	533,815	1827 . . . . .	1,874,610
1728 . . . . .	710,223	1828 . . . . .	1,893,083
1729 . . . . .	658,744	1829 . . . . .	2,095,420
1730 . . . . .	610,313	1830 . . . . .	2,116,023
1731 . . . . .	633,893	1831 . . . . .	2,053,673
1732 . . . . .	600,757	1832 . . . . .	2,149,820

In 1838, the importation had increased to 2,582,770 tons; in 1845, to 3,461,199 tons; and in 1848, it amounted to 3,418,340 tons.

## LIST OF PATENTS FOR 1849.

### JANUARY.

AINE, J. B. F. M., impts. steam-engines  
 BARBERIS, A., impts. in spinning and winding  
 BARLOW, H. B., impts. in the manufacture of cut-piled fabrics  
 BARLOW, W. H., impts. perm. ways for railways  
 BESSEMER, H., impts. in the manufacture of glass  
 BETTS, W., impts. in capsules  
 BLAKE, O., impts. in ventilation  
 BOGGETT, W., impts. in obtaining motive power  
 BOTTOM, J. F., and DUNNICLIFF, J. D., impt. in dressing fabrics  
 BROOMAN, R. A., impts. in artificial limbs

BROWN, S., impts. in measuring liquids  
 BUCHLER, E., impts. in boots and shoes  
 CALVERT, F. A., imps. in cleaning wool  
 CASTLEY, J., improvements in the manufacture of varnishes, &c.  
 DE BERGUE, C., impts. in steam-engines, &c.  
 DUGDALE, R., impts. in hardening iron  
 FRANCIS, H., impts. in cutting wood  
 GIBSON, J. G., impts. in spinning  
 GODEFROY, P. A., impts. in dressing woven fabrics  
 GOUGY, P. F., impts. in moving heavy bodies  
 GREENHOW, C. H., impts. in atmospheric railways  
 HADDAN, J. C., impts. in railway wheels



HAMILTON, J., impts. in cutting wood  
 HOBLER, F., impts. in capstans and windlasses  
 JOHNSON, R., impts. in brewing and fermentation  
 KENWORTHY, W., impts. in looms for weaving  
 KNAPTON, W., impts. in gasometers  
 LAMING, R., impts. in obtaining sulphuric acid  
 LOAM, M., impts. in fuzees  
 MARTIN, W., impts. in figuring textile fabrics  
 MCCLELLAN, C., an improved corn-mill  
 MOAT, W. C., impts. in steam-engines  
 MUNN, R., impts. in looms for weaving  
 NEEDHAM, H., impts. in fire-arms  
 NEWCOMB, T., impts. in furnaces  
 NEWTON, W. H., impts. in wheels  
 NICKELS, impts. in manufacture of caoutchouc  
 PARIS, C. H., impts. in preventing the oxidating of iron  
 PIM, W., impts. in propelling vessels  
 REECE, R., impts. in treating peat  
 RIEPE, E., impts. in the manufacture of soap  
 ROBINSON, T., impts. in spinning, combing, &c.  
 ROWE, W., impts. in uniting glass or earthenware pipes  
 SHAW, R., and COTTAM, S. F., impts. in spinning  
 SLAUGHTER, E., impts. in marine steam-engines  
 STEWART, D. Y., impts. in casting iron  
 THOMAS, W., impts. in window-blinds  
 TYLER, J. T., impts. in hats, caps, &c.  
 URWIN, R., impts. in steam-engines  
 WALKER, W., impts. in machine for cleaning roads  
 WILKINS, A., and STACEY, W., impts. in heating and boiling liquids  
 WILLIAMS, G., impts. in furnaces  
 WRIGHT, S. W., impts. in spinning  
 WRIGLEY, M., impts. in the manufacture of yeast

## FEBRUARY.

BARKER, J., impts. in umbrellas and parasols  
 BARNES, J., impts. in bleaching  
 BIRAM, B., impts. in miners' lamps  
 BLAKE, O., impts. in the manufacture of glass  
 BOTTOMLEY, J., impts. in weaving  
 BREWER, W., and SMITH, J., impts. in producing water-mark on paper, &c.  
 BRINDLEY, W., impts. in waterproof paper  
 BROWN, R., impts. in perforating and riveting  
 BROWNE, J., impts. in rigging vessels, and in railways  
 CARTERON, J. A., impts. in dyeing  
 CHANDOS, A., impts. in extracting colouring matters

CLARKSON, T. C., impts. in the application of leather, India-rubber, &c.  
 CROSSLEY, H., improved method of heating and lighting  
 CUTLER, J., impts. in metal pipes or tubes  
 DAVID, P. I., impts. in bleaching  
 DAY, W. C., impts. in machine for weighing  
 DE BOURCICAULT, D., impts. in distributing fluids  
 DONISTHORPE, G. E., and MILNES, J., impts. in stopping steam-engines  
 ERWOOD, J., impts. in paper-hangings  
 FISHER, H., impts. in coke-ovens, heating, &c.  
 FORLONG, R. P., impts. in castors for furniture  
 GIBLETT, J., impts. in woollen cloth  
 HARRIS, W., impts. in preparing leather  
 HARRISON, J. W., and ODDIE, J., impts. in looms for weaving  
 HICK, J., and GRATRICK, W. H., impts. in steam-engines and propelling  
 HILL, L., impts. in the manufacture of iron  
 JACOB, C., impts. in earthenware pipes  
 KURTZ, C. A., impts. in looms for weaving  
 LORD, E., impts. in preparing fibrous substances  
 NEWTON, E., impts. in engines  
 NEWTON, E., impts. in polishing grain  
 NICKELS, C., impts. in woollen and other fabrics  
 PALMER, J., impts. in lucifers and match-boxes  
 PARISH, H. H., impts. in lamps and gas-burners  
 PARSONS, P. M., impts. in railways, engines, &c.  
 PATINSON, H. L., impts. in compound of lead  
 PEARCE, C. T., impts. in light by electricity  
 PINCHBECK, E. G., impts. in steam-engines  
 POLLARD, R., improved machinery for making rope  
 REMOND, A. F., impts. in envelopes  
 ROCHAZ, C. A. F., impts. in oxide of zinc, &c.  
 ROWLANDSON, T., impts. in the treatment of mineral waters  
 SLEIGH, W. W., impts. in preventing accidents on railways  
 SNOWDEN, T., impts. in artificial fuel  
 STURGES, R. F., impts. in candlesticks, lamp-pillars, &c.  
 TAYLOR, J., impts. in fencing-walls  
 TOOTH, W., impts. in water-closets, &c.  
 TOWNSEND, M., and MOULDEN, D., impts. in the manufacture of looped fabrics  
 WEBSTER, J., impts. in manufact. gas  
 WHITWORTH, C. F., impts. in preventing accidents on railways  
 WILLSON, G. F., impts. in separating fatty matters



## MARCH.

BAIRD, J., and WHITELAW, A., impts. in the manufacture of iron  
 BANKS, S., impts. in mills for grinding  
 BECKETT, W., and POWELL, S., impts. in wearing apparel  
 BERANGER, J., impts. in weighing-mach.  
 BRAGG, A., impts. in propelling by atmospheric pressure  
 BRITTON, J., impts. in cooking apparatus  
 BROOKE, J. W., impts. in lamps  
 BUCKWELL, W., impts. in compressing food  
 CHAUFFOURIER, P. A., impts. in watches  
 CLARKE, T., and MOTLEY, T., impts. in motive power  
 DE BARROS, J., impts. in machinery for making lasts and other irregular forms  
 DE FONTAINEMOREAU, P. A., Le Comte, impts. in coating metallic bodies  
 DEFRIES, N., and PETTIT, G. B., impts. in applying gas for heating purposes  
 FLETCHER, J., and FULLER, T., impts. in machinery for planing and cutting metal  
 GRATIEX, W., impts. in woven fabrics  
 GREEN, W. H., impts. in the preparation of fuel  
 GREEN, C., and NEWMAN, J., impts. in railway wheels  
 GUERIN, P. R., impts. in steering vessels  
 HAIL, S., impts. in the combust. of fuel  
 HARRISON, T., impts. in ovens  
 HARTLEY, W., impts. in steam-engines  
 HENDERSON, D., impts. in metal castings  
 HOWARD, H., impts. in manuf. of glass  
 JENNINGS, H. C., impts. in manufacturing pigments and white lead  
 KNOX, G., impts. in railway carriages  
 LAWRENCE, J., impts. in brewing and storing liquids  
 MACINTOSH, J., impts. in furnaces and motive power  
 MANTON, G. H., and HARRINGTON, J., impts. in fire-arms  
 MASON, J., and COLLIER, G., impts. in machinery for spinning  
 McDUGALL, A., impts. in treating woollen and other fabrics  
 MOORE, R. R. R., impts. in letters for shop-fronts  
 NEWTON, A. V., impts. in piled fabrics  
 NORTON, F. W., impts. in figured fabrics  
 PARKES, A., impts. in treating metals  
 PARKINSON, W., impts. in gas and water meters  
 PAYNE, W., impts. in clocks and watches  
 PICKERING, W. H., impts. in evaporating fluids  
 PLUMMER, R., impts. manuf. of flax, &c.  
 REYNOLDS, O., impts. in railways  
 RUSSELL, T. H., and WOOLRICH, J. S., impts. in coating metals  
 SATCHELL, R., impts. in depositing seeds, &c.  
 SHANKS, A., an improved mode of giving form to metals  
 SIEMENS, C. W., impts. in steam-engs.

SMITH, J., impts. in the manuf. of flour  
 SWAN, A., impts. in heating apparatus  
 THOMSON, F. H., impts. in smelting ores  
 THOMSON, G., and ELMS, J., impts. in making fire-wood  
 VOILLON, F., impts. in hats, caps, &c.  
 WESTHEAD, E., impts. manuf. waddings  
 WHITE, S., impts. in furnaces and manufacture of gases  
 WILSON, G. F., impts. in candles, &c.  
 WILSON, J. T., impts. in sulphuric acid

## APRIL.

ALLIOTT, A., impts. in registering the force of water, steam, &c., and the velocity of carriages  
 BARSHAM, J., impts. in separating the fibre from cocoa-nut husks  
 BENIOWSKI, B., impts. in printing  
 BESSEMER, H., impts. in manuf. sugar  
 BRANDT, G., impts. in railway engines and carriages  
 BROQUETTE, C. A., impts. in printing and dyeing  
 BURKE, W. H., impts. in the preparation of gutta percha and caoutchouc  
 CARPENTER, S. A., impts. in buckles  
 CHILDS, J., impts. in candles  
 CLEGG, R., HENDERSON, J., and CALVERT, J., impts. in looms  
 COCKSEY, T., and NIGHTINGALE, J., impts. in machines for cleansing, dyeing, and printing  
 DUNINGTON, H., impts. in looped fabrics  
 FAULCONBRIDGE, W., impts. in hose-pipes, &c.  
 GARNIER, A., impts. in extracting colouring matters  
 GEACH, C., and WALKER, T., impts. in axletrees and shafts (ext. of four yrs.)  
 GORDON, R., impts. in ventilating mines  
 GREENING, T. N., impts. in knives and forks  
 HORSLEY, J., impts. in preventing incrustation in boilers  
 ILES, C., impts. in producing ornamental surfaces  
 KENNINGTON, G., impts. in steam and hydraulic engines  
 KILNER, W., impts. in wheels and axles  
 KNAPP, W. H., impts. in matches and firewood  
 LITTLE, W., impts. in lubricating machinery  
 MCBRIDE, W., impts. oxygenating water  
 NEWTON, A. V., impts. in assorting solid materials  
 NEWTON, E., impts. in the manuf. of lace  
 NEWTON, W. E., impts. in boilers  
 ORMEROD, J., impts. carding cotton, &c.  
 OXLAND, R. and J., impts. in manufacture of sugar  
 PARRY, W., impts. in horse-shoes  
 PHILLIPS, W. H., impts. in extinguishing fire  
 PIERON, L. P. N. D., impts. in pipes and tram-roads

RUTHVEN, J., impts. producing pressure  
 SHEPHERD, —, impts. in electric clocks  
 and telegraphs  
 SIMPSON, G., and FORSTER, T. in treat-  
 ing gums, &c.  
 THOMPSON, T. H., impts. reservoirs, &c.  
 VERNY, L., impts. in preserving vegeta-  
 ble and animal substances  
 WILSON, J. G., and PIDDING, W. impts.  
 in furnaces and fire-places  
 WOOLLETT, A., impts. in gun-carriages

## MAY.

ALLPORT, S., impts. in looms  
 BESSEMER, H., and HEYWOOD, J. S. C.,  
 impts. in treating oils, &c.  
 BULLER, T. W., impts. manuf. earthenw.  
 COLEGRAVE, F. E., impts. in signals on  
 railways  
 CROSSE, A., impts. in tanning  
 DA COSTA, S. I., impts. in vessels, &c.  
 DALTON, J., impts. printing calicoes, &c.  
 DE CHATAUVILLARD, L. A., impts. in  
 fire-arms  
 DE FONTAINEMOREAU, P. A., Le Comte,  
 impts. in weaving  
 DODGE, G. H., impts. in spinning, &c.  
 DONISTHORPE, G. E., and WHITEHEAD,  
 J., impts. in combing and hackling  
 fibrous matters  
 DUGDALE, J., and BIRCH, E., impts. in  
 propelling vessels  
 GOODFELLOW, T. and G., impts. in pre-  
 paring plastic materials  
 GRUNDY, E., and FARROW, J., impts. in  
 spinning  
 HODGES, R. E., impts. in mechanical  
 purposes  
 KENNEDY, M., impts. in packing  
 MUNKILTRITCH, A., impts. in lubricat-  
 ing machinery  
 NEWTON, W., impts. in the Jacquard  
 machine  
 PARKER, W. P., impts. in pianofortes  
 POOLE, M., impts. in drawing fluids from  
 the human body  
 REECE, R., and PRICE, A. P., impts. in  
 the manufacture of sugar  
 SMITH, A., impts. in rope and cordage  
 SMITH, C., impts. in wearing apparel  
 SMITH, D., impts. in the manuf. of lead  
 STEINER, F., impts. in Turkey red dye  
 SUTCLIFFE, R., impts. in spinning  
 THORN, J., impts. in drying and bleaching  
 WALLER, S., impts. in weaving  
 WHALEY, T., and LIGHTOLLER, R. A.,  
 impts. in the manufac. of bricks & tiles  
 WILKES, S., impts. in handles and knobs  
 for doors  
 WILSON, J., impts. in trusses  
 WILSON, J. G., impts. in manuf. of glass

## JUNE.

ANTHONY, C. J., impts. in treating ani-  
 mal matter  
 BARLOW, P. W., impts. in permanent  
 ways of railways

BERTHON, E. L., an instrument to show  
 the speed of vessels, &c.  
 BESSEMER, H., impts. in raising fluids  
 BIRLEY, T. H., impts. in spinning (ex-  
 tension for five yrs. from 27th May)  
 BOVILL, G. H., impts. in manufacture of  
 meal and flour  
 BROOMAN, R. A., impts. in filling bottles  
 BROWNE, T. B., impts. in looms  
 BURCH, J., impts. in printing  
 BURTON, B. A., impts. in bricks, tiles, &c.  
 CAMPBELL, A. F., impts. in wheels,  
 steam-boilers, &c.  
 COLT, S., impts. in fire-arms  
 DENISON, J. W., impts. in engines  
 DUNN, S., impts. in constructing tunnels  
 FIELD, O., impts. in anchors  
 FORSTER, J. T., impts. in building ships  
 GOOSE, W., impts. in making nails  
 GRAY, T. W., impts. in water-closets, &c.  
 GRIFFIN, C. J. C., impts. in military ac-  
 countrements  
 HAINES, M. J., impts. in packing, &c.  
 HEBSON, D., impts. in steam-engines  
 HERTZ, B., impts. in fountain pens  
 HOUSTON, J., impts. in obtaining mo-  
 tive power  
 HULOT, J., impts. in shirt fronts  
 JACOB, W. C., impts. in parasols and  
 umbrellas  
 JOWETT, T., impts. in looms  
 KNIGHT, H., impts. in printing and em-  
 bossing  
 LAURENT, V. H., impts. in looms  
 LAWES, T., impts. in obtaining motive  
 power  
 LEADBETTER, J., impts. in raising water  
 MASTERS, T., impts. in appar. for cooking  
 MERCHANT, T., and HARLAND, R.,  
 impts. in railway carriages  
 MILLER, D., an improved method of  
 drawing ships up an inclined plane  
 NASMYTH, J., impts. in machinery em-  
 ployed in dyeing, printing, &c.  
 NEILSON, W., impts. in moving heavy  
 bodies  
 NEWTON, W. E., impts. heating buildgs.  
 NICKELS, C., impts. in manufacturing  
 woollen fabrics  
 PAYNE, E. J., impts. in marine vessels,  
 and in machinery for moulding figures  
 PAYNE, J. E. H., and CURRIE, H. W.,  
 impts. in the manufacture of coach-lace  
 PICAULT, G. F., impts. opening oysters  
 POOLE, M., impts. in pistons, valves,  
 brewing, &c.  
 PREDDY, W., impts. in watch-keys  
 RITCHIE, W. H., impts. in fire-arms  
 SAMUDA, J., impts. in obtaining motive  
 power  
 SIMPSON, G., impts. in machines for  
 moving heavy bodies  
 SLACK, E., impts. in textile fabrics  
 SMITH, S. B., impts. in motive power  
 SMITH, W. H., impts. in breakwaters  
 STEEL, J., and EMERSON, B., impts. in  
 power-looms

STOWE, H. M., impts. blocks and sheaves  
 THORNEYCROFT, G. B., impts. in railway tyres, &c.  
 TREWHITT, H., and CRAMPTON, T. R., impts. in steam-engines  
 WILSON, R., impts. in steam-engines, boilers, &c.  
 WILSON, W., impts. in cutting tubes or tiles  
 WOODS, E., impts. in turntables

## JULY.

BAILEY, H., impts. in wearing apparel  
 BOWDEN, J., and LONGMAID, W., impts. in the manufacture of soap  
 BROOMAN, R. A., impts. in steam generators  
 BROTHERHOOD, R., impts. in railway trucks  
 BROWN, W. H., impts. in rolling iron  
 BROWN, W., MAPPLE, H., and WILLIAMS, N., impts. in electricity and electric clocks  
 BROWNE, J., impts. in stoves and grates  
 BUSH, W., impts. in lamps and lighting  
 CHAUFFOURIER, P. A., impts. in castors  
 COMBE, J., impts. in carding and winding flax, &c.  
 COTTAM, G. and E., impts. in machine cutting, &c.  
 FULLER, E. I., and TABERNACLE, G., impts. in carriage springs  
 GARRETT, R., impts. in thrashing machinery, and steam-engine  
 GOODIER, J., impts. in grinding grain  
 GRANTHAM, J., impts. in sheathing ships  
 GREENWOOD, T., and PARKER, F., impts. in filtering liquids  
 HOLLAND, J., a new mode of making steel  
 HOLT, J., impts. in machinery for preparing fibrous substances  
 HOW, A. P., instrument for ascertaining the saltiness of water in boilers  
 KNOWLES, Sir F. C., impts. in manufact. iron and steel  
 LAUBIE, W., impts. in furniture and travelling apparatus  
 LEIGH, E., impts. in steam-engines  
 LISTER, S. C., and DONISTHORPE, G. E., impts. in preparing and spinning wool  
 MULBERRY, J., impts. in steam valves  
 PLANT, R., impts. in manufacturing iron  
 ROBINSON, J., impts. in moving weights  
 ROBINSON, G. A., and LEE, R. E., impts. in ovens and furnaces  
 ROSE, A. F., impts. in printing  
 SUMMERS, T. S., impts. in fastening sacks  
 THOMSON, R. W., impts. in drawing instruments  
 USHER, J., impts. in tilling land  
 WALKER, T., impts. in boots and shoes  
 WEARE, R., and PIGGOTT, W. P., impts. in electricity  
 WILDING, W. H., impts. in obtaining motive power  
 WOODS, J., impts. in bleaching organic substances

## AUGUST.

AINSWORTH, B., impts. in ornamenting metals  
 BAXTER, G., impts. in printing in colours (extension for five years)  
 BERTRAND, L., impts. in carriages  
 BLAKE, J., impts. in lamps  
 BODMER, F. W., impts. in letter-press printing  
 BOUCHER, E. A. D., impts. manuf. cards  
 BROOMAN, R. A., impts. in extracting and evaporating substances  
 CHAMIER, F., impts. in ships' blocks  
 COWPER, C., impts. in steam-engines and lowering weights  
 DAY, R. K., impts. in scouring fabrics  
 DE CAVAILLON, F. J., impts. in obtaining and applying hydrogen gas  
 DRIEN, J. A., impts. in wearing apparel  
 DUNN, A., impts. in making soap  
 FUESS, W., impts. in machinery for cutting wood  
 GEEVES, W., impts. in making boxes  
 HARCOURT, D., impts. in mak. hinges, &c.  
 HARRINGTON, G. F., impts. in artificial teeth  
 HOLDSWORTH, A. H., impts. in marine boilers  
 KNAB, D. C., apparatus for distilling fatty matters  
 KNOWLYS, J., impts. in obtaining and applying vegetable products  
 LEMAITRE, L., impts. in ferules  
 MACFARLANE, M., impts. in finishing woven fabrics  
 MOREY, C., impts. in embroidery and stitching  
 MURDOCH, J., impts. in ventilating ships and evaporating liquids  
 NEWTON, A. V., impts. in raising heavy bodies  
 NEWTON, A. V., impts. in refining sugar  
 NEWTON, W. E., impts. in steam-boilers  
 PARKINSON, J., impts. measuring liquids  
 PECQUEUR, G., impts. in nets  
 POTTS, T., impts. appar. for curtains, &c.  
 PRIDEAUX, T. S., impts. in furnaces and steam-boilers  
 ROBINSON, J., impts. in manufacture of orchil and cudbear  
 ROELM, A., impts. in making roads and covering floors, &c.  
 ROGERS, J. E. D., impts. in manufacture of white lead  
 RUTHVEN, J., impts. in propelling vessels  
 SHAW, J., impts. in air-guns  
 THOMAS, W., and MARSH, J., impts. in stays and other parts of dress  
 THOMPSON, B., impts. in the manufacture of iron  
 YOUNG, J., impts. in treating metals  
 YULE, A., and CHANTER, J., impts. in coating ships, &c.

## SEPTEMBER.

AITKEN, J., impts. in machinery for dressing cotton, flax, &c.



ATTWOOD, H., and RENTON, J., impts. in farinaceous substances  
 BESSEMER, H., impts. in prep. of fuel  
 BLASHFIELD, J. M., impts. in manure  
 BOGETT, W., impts. in heating and evaporating fluids  
 BROOMAN, R. A., impts. in saddlery  
 BROWN, D. S., impts. fumigating plants  
 BROWNE, W., and VEALE, R. R., impts. in preparing ores, minerals, &c.  
 CHAMEROY, E. A., impts. in railways, &c.  
 COOPER, J. R., impts. in fire-arms  
 EDWARDS, D. O., impts. in radiating heat  
 GALLOWAY, E., impts. in furnaces  
 GOODFELLOW, B., impts. in steam-engines  
 GRIFFITHS, R., impts. in steam-engines  
 GRIFFITHS, T., impts. in tea-pots, &c.  
 HAIG, A., impts. in driving atmospheric air  
 HANDLEY, W., DUNCAN, G., and Mc GLASHAN, A., impts. in railway breaks  
 HEATH, J. M., impts. in manuf. steel  
 HEYWOOD, E., impts. in weaving  
 HIGGINS, J., and WHITWORTH, T. S., impts. in spinning  
 HIGGINS, J., and WHITWORTH, T. S., impts. in machinery for dressing flax, cotton, &c.  
 HOSKING, J., an improved pavement  
 LORAIN, J., impts. in treating gelatinous substances  
 MACNEILL, Sir JOHN, and BARRY, T., impts. in locomotive engines  
 MAILLARD, N. D., impts. in propelling  
 MARSDEN, C., impts. in drain-traps  
 MARSDEN, T., impts. in machinery for combing and dressing flax  
 MASON, J., and COLLIER, J., impts. in machinery for dressing cotton, &c.  
 MEADOWS, J., impts. in veneering  
 NEWTON, W. E., impts. in pumps  
 NEWTON, W. E., impts. in furniture  
 PARKINSON, W., impts. in gas-meters  
 PEARCE, W., and EVANS, E., impts. in steam-engines  
 POTTER, J., impts. in spinning  
 PRETERRE, N. P., impts. in coffee and tea-pots  
 STAITE, E., and PETRIE, W., impts. in electric lighting  
 TERRY, A. R., impts. in manuf. fire-wood  
 VAUDY, J. B., impts. in dyeing silk  
 WARREN, J., and MONGEINE, T., impts. in the construction of bridges, &c.  
 WREN, B., impts. in cleaning grain

## OCTOBER.

BRANDT, W. G., impts. in railway carriages  
 BROWNE, T. B., impts. in looms  
 CHRISTIE, D., impts. in welding cast iron with steel and wrought iron  
 CLEGG, R., HENDERSON, J., and CALVERT, J., impts. in looms for weaving  
 COMBE, J., impt. in carding machinery  
 DONGE, G. H., impts. in machinery for cotton-spinning

EDWARDS, D. O., impts. in gas  
 FINZEL, W., impts. in sugar machinery  
 GODLIN, J., impts. in mills  
 GRAPEL, E., impts. in marine vessels  
 HOLLAND, J., a new mode of making steel  
 JAMIESON, W., impts. in looms for weaving  
 LIGHTFOOT, T., impts. in printing cotton  
 MACINDOE, G. P., impts. in machinery for cotton-dressing, &c.  
 MERCER, J., and BLYTHE, W., impts. in dyeing  
 NEWTON, W. E., impts. in carpenters' machinery  
 NORTON, F. W., impts. in fancy fabrics  
 PARKES, A., impts. in alloys  
 PLUMER, R., impts. in machinery for dressing fibrous materials  
 RITCHIE, W. H., impts. in fire-arms  
 ROBERTSON, J., impts. in machinery for raising weights  
 SHEPHERD, C., and SHEPHERD, C., jun., impts. in clocks and chronometers  
 STOVEL, J., impts. in coats

## NOVEMBER.

ADOR, A., impts. in producing light  
 AMOSS, C. E., and CLARK, M., impts. in the manufacture of paper  
 BARKER, C. M., impts. in sawing wood and metals  
 BARLOW, A., impts. in weaving  
 BARLOW, A., impts. in pigments  
 BARLOW, P. W., impts. in railways  
 BARROW, J., impts. in axles for railway carriages  
 BRINDLEY, W., impts. in papier-mâché  
 BUCKWELL, W., and APSEY, J., impts. in steam-engines  
 BUCKWELL, W., impts. in pipes  
 BUCKWELL, impts. in compressing fuel  
 CALLOWAY, G., and PURKIS, R. A., impts. in the propulsion of vessels  
 CHAMBERS, E., impts. in wheels  
 CHESTERMAN, J., impts. in drilling-instruments  
 COMBE, J., impts. in machinery for dressing flax  
 COTTON, A., firm of J. Elce & Co., impts. in machinery for spinning cotton  
 COWLEY, J., and HICKMAN, J., impts. in the manufacture of bedsteads, &c.  
 COWPER, C., impts. in the treatment of coal, &c.  
 COWPER, C., impts. in the manufacture of sugar  
 COWPER, C., impts. in forging iron  
 CROSLY, H., improved mode of drying  
 CRUM, W., impts. in woven fabrics  
 DE CHANGY, C. E. F. C. P., impts. in preparing fibrous substances  
 DE FONTAINEMOREAU, P., impts. in weaving  
 DONISTHORPE, G. E., and MILNES, J., impts. in machinery for stopping steam-engines



DONISTHORPE, G. E., and WHITEHEAD, J., impts. in preparing fibrous matter  
 DUBURQUET, F. J., impts. in hydro-pneumatic-engines  
 DUFFERNY, L. A., impts. in machinery for figures in relieve  
 GILLARD, J. P., impts. in the production of heat  
 GORDON, J., impts. in ships  
 HAINES, M. J., impts. in bands for machinery  
 HANCOCK, J. W., impts. in the manufacture of hosiery goods  
 HENSON, J. H., impts. in railways  
 HILLS, F. C., impts. in the compression of peat  
 HOLT, J., impts. in machinery for dressing cotton  
 KEELY, T., and WILKINSON, W., impts. in elastic fabrics  
 KNIGHT, H., impt. in printing machinery  
 KNOWLES, T. J., impts. in the mixing of vegetable and mineral products  
 LAMPLOUGH, H., new mode of supplying water  
 LE GRAS, L. N., impts. in disinfecting manure  
 LOWE, J., impts. in grates  
 MEINIG, C. L. A., impts. in galvanism  
 McDUGALL, A., impts. in recovering useful products from water used in washing cotton fabrics  
 MORRIS, W., impts. in preparing clay  
 MACINDOE, G. P., impts. in machinery for twisting flax  
 NEWRY, J. G., and NEWMAN, J., impts. in button-studs  
 NEWTON, W. E., impts. in steam-boilers  
 NEWTON, W. E., impts. in boring instruments  
 NEWTON, A. V., impts. in manufacturing leather  
 OLIVER, S. B., impts. in dyeing  
 PALMER, F. O., impts. in candles  
 PARKINSON, J., impts. in meters for liquids  
 PARNELL, R., impts. in sewing woollens  
 POWNALL, J., for an improved odometer  
 RUFFORD, F. T., MARSDEN, I., and FINCH, J., impts. in the manufacture of baths  
 STOCKER, S., impts. in beer-engines  
 STURGES, R. F., and HARLOW, J., impts. in bedsteads  
 TAYLOR, W. G., impts. in linting machines  
 TUCKER, W., impts. in the manufacture of mantel-pieces  
 VIDIE, L., impts. on conveyances by land and water  
 WESTHEAD, J. P., impts. in the manufacture of fur  
 WILSON, J. B., impts. in wire rope  
 WORSDELL, T., impts. in the manufacture of envelopes  
 YULE, A., CHANTER, J., and TERRACE, A., impt. in materials for coating ships

## DECEMBER.

ACKROYD, W., impts. in dressing worsted  
 BERTHON, E. L., impts. in discharging water from ships  
 BICKMYRE, impts. in the manufacture of sugar  
 BUCHANAN, G., impts. in the manufacture of stop-cocks  
 CARTER, E., impts. in printing calico  
 CHRISTIE, J. H., impts. in the manufacture of wrought-iron wheels  
 CHRISTIE, D., impts. in machinery for wool  
 COWPER, C., impts. in steam-regulators  
 DALTON, A., impts. in furnaces  
 DAVIES, J. & G., impts. in steam-engines  
 DE LA RUE, W., impts. in envelopes  
 DE STRUBING, Baron, impts. in axles of railway carriages  
 DONISTHORPE, G. E., impts. in wheels of locomotives  
 ECARNOT, J. B., impts. in mineral acids  
 FAIRBAIRN, P., and HETHERINGTON, J., impts. in machinery for fibrous substances  
 FAWCETT, B., impts. in pigments  
 FISHER, S., impts. in railway carriages  
 GRIMSBY, T., impts. in the manufacture of bricks  
 HACKWORTH, T., and HACKWORTH, J. W., impts. in locomotives  
 HARCOURT, R., impts. in handles of doors  
 HOBSON, R., impts. in horse-shoes  
 HOLT, W., impts. in musical instruments  
 JENKINSON, J. H., and PRIESTLY, T., impts. in machinery for fibrous materials  
 LIZARS, C., impts. in gas-meters  
 MARCHANT, J., and HARLAND, R., impts. in railway carriages  
 MONTGOMERY, C., impts. in brewing  
 NAYSMITH, J., impts. in machinery for textile fabrics  
 OLDKNOW, J., impts. in the manufacture of lace  
 PARIDIS, J., impts. in the manufacture of elastic cushions  
 PRESTI, Baron L., impts. in hydraulic presses  
 PULVERMACHER, I. L., impts. in galvanic batteries  
 ROBERTS, H., impts. in the manufacture of bricks  
 SHUTE, T. R., impts. in silk-throwing  
 SMITH, J., impts. in treating the fleeces of sheep  
 SPRAY, F., and NEVETT, G., an improved steam-engine  
 TALBOT, H. F., and MALONE, T. A., impts. in photography  
 THOMPSON, F. H., and VARNISH, E., impts. in the manufacture of inkstands  
 WHITWORTH, J., impts. in machinery for cutting metals  
 WYTHES, G., impts. in rails

PATENTS ASSOCIATED WITH MINING granted from January 1 to  
December 31, 1849.

AINGORTH, Metals .....	Aug. 1	FAWCETT, Paints .....	Dec. 15
ATTWOOD, Iron .....	Oct. 5	FINDLAY & WILKIE, Turning, cutting, shaping, and reducing .....	Aug. 10
BANISTER, Boiler tubes.....	Oct. 12	FISHER, Railway-carriages, &c. Dec. 5	Dec. 5
BARLOW, Railways .....	Nov. 14	FURNES, Sharpening tools, and welding steel to cast iron ....	Aug. 9
BARLOW, Pigment .....	Nov. 29	GALLOWAY, Furnaces .....	Sept. 20
BARROW, Axle and axle-boxes ..	Nov. 24	GEEVES, Boxes .....	Aug. 1
BARKER, Sawing and cutting ..	Nov. 10	GILLARD, Heat and light .....	Nov. 22
BESSEMER, Fuel and furnaces..	Sept. 20	GOODFELLOW, Steam-engines ..	Sept. 13
BOGGETT, Heating and evapo- rating .....	Sept. 27	GOODIER, Mills .....	July 9
BONELL, Rotary engines, car- riages, and vessels .....	Oct. 12	GRANTHAM, Sheathing ships ..	July 4
BRANDT, Bearings .....	Oct. 11	GRAPEL, Marine vessels, mould- ing, and gums .....	Oct. 8
BROOMAN, Steam generators ..	July 4	GREENWOOD & PARKER, Filter- ing .....	July 4
BROOMAN, Extracting, drying, and evaporating .....	Aug. 16	GRIFFITHS, Steam-engines and propelling .....	Sept. 13
BROWN, Rolling-mills .....	July 4	GRIFFITHS, Stamped metal ar- ticles .....	Sept. 20
BROWN, MAPPLE, & WILLIAMS, Electric telegraphs and clocks ..	July 18	GRIMSLEY, Bricks and tiles ....	Dec. 10
BROWNE, Stoves .....	July 4	HACKWORTH, Steam-engines ..	Dec. 15
BUCHANAN, Cocks, valves, and joints .....	Dec. 3	HAIG, Motive power .....	Sept. 6
BUCKWELL & APSEY, Steam-en- gines and propelling .....	Nov. 2	HAINES, Bands, hose, and buffers	Nov. 2
BUCKWELL, Pipes and moldable articles .....	Nov. 17	HAMILTON, Cutting wood ....	June 28
BUCKWELL, Compressing fuel ..	Nov. 5	HANDLEY, DUNCAN, & Co., Rail- way breaks.....	Sept. 20
CAMPBELL, Motive power and propelling .....	Oct. 18	HARCOURT, Vices, hinges, and metal .....	Aug. 1
CHAMBERS, Wheels .....	Nov. 10	HEATH, Steel .....	Sept. 6
CHAMIER, Ships' blocks .....	Aug. 23	HENSON, Railways and carriages	July 18
CHESTERMAN, Drilling & boring	Nov. 13	HILLS, Peat and gas .....	Nov. 24
CHRISTIE, Uniting iron and steel	Oct. 19	HOLDSWORTH, Marine boilers and funnels .....	Aug. 9
CHRISTIE, Wheels .....	Dec. 10	HOLLAND, Steel .....	July 18
CHRISTOPHERS, Naval architec- ture .....	Oct. 12	HULETT & PADDON, Gas meters and regulators .....	Oct. 18
COTTAM & COTTAM, Cutting and power of machines .....	July 12	JOHNSON & CLIFFE, Furnaces..	Oct. 12
COWPER, Minelifting machinery and steam-engines .....	Aug. 23	KNOWLES, Iron and steel .....	July 4
COWPER, Coal .....	Nov. 2	KNOWLIS, Mineral and vegetable substances, and generation of heat .....	Aug. 9
COWPER, Iron .....	Nov. 24	KNOWLIS, Application, removal, and compression of atmospheric air .....	Sept. 10
COWPER, Indicator.....	Dec. 15	LEIGH, Steam-engines .....	July 18
CROSLY, Heating and lighting	Nov. 7	LO PRESTI, Hydraulic engines..	Dec. 10
CUTLER, Metallic tubes.....	Aug. 28	MACNEILL & BARRY, Locomo- tives and railways .....	Sept. 6
DALTON, Furnaces .....	Dec. 15	MAILLARD, Motive power and propelling .....	Sept. 27
DAVIES & DAVIES, Power en- gines .....	Dec. 10	MEINIG, Galvanism and mag- netism.....	Nov. 17
DAY, Weighing-machines.....	Aug. 29	MOAT, Steam, air, or gas engines	July 16
DRELEY, Ovens and furnaces ..	June 13	MORRIS, Bricks and tiles .....	Nov. 2
DE STRUBING, Bearings & alloys	Dec. 3	MULBERRY, Slide valves.....	July 4
DONISTHORPE & MINES, Appa- ratus for stopping steam-en- gines .....	Nov. 17	MURDOCK, Converting sea-water into fresh .....	Aug. 1
DONISTHORPE, Wheels.....	Dec. 3	NASMITH, Regulating and driv- ing power-machines.....	Aug. 24
DREBURGUET, Hydro-pneumatic engines .....	Nov. 22		
ECARNOT, Sulphuric and other acids and nitrates.....	Dec. 10		
EDWARDS, Application of gas ..	Sept. 20		

NASMYTH, Roofing viaducts, aqueducts, and culverts .....	Sept. 18	SMITH, Lead .....	June 25
NEILSON, Steam-engines .....	June 25	SPRAY & NIVETT, Meters and steam-engines .....	Dec. 21
NEWTON, Steam-boilers .....	Aug. 23	STAITE & PETRIE, Electric and galvanic instruments .....	Sept. 20
NEWTON, Pumps .....	Sept. 20	THOMPSON, Iron .....	Aug. 1
NEWTON, Pipes .....	Oct. 5	THOMSON & VARNISH, Glass vessels .....	Dec. 19
NEWTON, Boring and driving piles .....	Nov. 2	THORNEYCROFT, Railway axles, tyres, and iron .....	July 16
PARKES, Metals and alloys ....	Oct. 24	TORKINGTON, Railway chairs ..	Oct. 12
PATTISON, Lead .....	Aug. 6	URWIN, Steam-engines & pumps	July 9
PEACE & EVANS, Steam-engines and pumps .....	Sept. 20	VIGNOLES, Peat .....	Sept. 10
PLANT, Iron .....	July 12	WARREN, Bridge, aqueducts, &c.	Sept. 27
PRIDEAUX, Furnaces and steam-boilers .....	Aug. 30	WATSON, Valves and cocks ....	Oct. 12
PULVERMACHER, Galvanism and electricity .....	Dec. 5	WEARE & PIGGOTT, Electric batteries, telegraphs, &c. ....	July 4
REECE, Treating peat .....	Aug. 25	WILDING, Motive power .....	July 4
ROBERTS, Bricks and tiles .....	Dec. 15	WILSON, Furnaces .....	July 11
ROBERTSON, Moving and raising weights .....	Oct. 3	WILSON, Sulphuric acid & alum	Aug. 15
ROBINSON, Moving and raising weights .....	July 4	WILSON, Wire ropes .....	Nov. 8
RODGERS, White lead .....	Aug. 1	WYATT, Coating surfaces .....	Oct. 18
RUTHVEN, Propelling and navigating .....	Aug. 10	WYTHES, Railway chairs .....	Dec. 15
		YOUNG, Ores .....	Aug. 16

## PART IV.

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### Tabular and Statistical Matter.

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#### WATER-WHEELS.

An easy method to calculate the power of a Water-wheel would be to add its diameter and width together, and then square the same. Multiply the contents by gallons of water contained in one bucket, which will give the number of lbs. weight the wheel is capable of lifting, allowing one-eighth for friction, thus:—Suppose a wheel 40 feet diameter with 4 feet breast, the buckets 42 inches in width, 13 inches deep, and 6 inches across—width and diameter 44 feet, which squared gives a result of 1,936, which again multiplied by  $11\frac{3}{4}$  gallons, being the contents of one bucket, makes a total of 23,748 lbs. weight, from which deducting one-eighth for friction, leaves 20,780 lbs., or 10 tons 7 cwt. 2 qrs. 24 lbs. Assuming the bucket, exclusive of ring, at 42 inches, and depth of bucket 13 inches, with 6 inches width, the result would be 3,276, which divided by 277.3, being the cubical or solid inches contained in a gallon, gives 11 gallons 3 quarts to each bucket, as above stated. The power of the wheel would thus be, according to the rule laid down for estimates, of this nature, by Boulton and Watts,  $103\frac{9}{10}$  horse-power, or in other words, 200 lb. horse to draw over pulley at rate of 224 feet per minute.

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#### COLUMN OF WATER.

**RULE** to find weight of column of water, say 12 inches to a depth of 50 fathoms.—Square diameter, which will give 144 lbs. to the 3 feet, or 288 lbs. to the fathom, and at the assumed depth of 50 fathoms this multiplied would give 14,400 lbs., or nearly  $6\frac{1}{2}$  tons, as the weight to be raised.

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#### RULE TO FIND STROKE IN SHAFT BY LEVERAGE OF BOB.

**SUPPOSE** King-post 10 feet 6 inches, crank 5 feet 6 inches, beam 11 feet 6 inches, the question is simply solved by a sum by the ordinary rule of three; as 10 feet 6 inches is to 5 feet 6 inches, so is 11 feet 6 inches, equal to 6 feet stroke.

\* \* The preceding rules are simple in themselves, and should be universally known; the object in the next volume will be to furnish others, and we court assistance; but, unfortunately, we too often find agents sadly wedded to old prejudices, and a degree of jealousy pervading them as to the abilities of others, and that more particularly the rising generation;—this is not as it should be.



## STATISTICS OF THE IRON TRADE.

In 1740 the make of Pig-iron in each county of England, as nearly as could be arrived at, was as follows:—

	Furnaces.	Tons.		Furnaces.	Tons.
Brecon ..	2	600	Monmouthshire ..	2	900
Glamorganshire ..	2	400	Nottinghamshire ..	1	200
Carmarthenshire ..	1	100	Salop ..	6	2,100
Cheshire ..	3	1,700	Staffordshire ..	2	1,000
Denbighshire ..	2	550	Worcestershire ..	2	700
Derbyshire ..	4	800	Sussex ..	10	1,400
Gloucestershire ..	6	2,850	Warwickshire ..	2	700
Herefordshire ..	3	1,350	Yorkshire ..	6	1,400
Hampshire ..	1	200			
Kent ..	4	400	Total ..	59	17,350

In 1750, the production of Great Britain was ..	Tons 22,000
1788, ditto ditto ..	by 85 furnaces ... 68,000
1796, ditto ditto ..	121 ,, ... 125,000
1806, ditto ditto ..	169 ,, ... 250,000
1820, ditto ditto ..	— ,, ... 400,000
1827, ditto ditto ..	284 ,, ... 690,000

By different districts, as follows:—

	Furnaces.	Tons.		Furnaces.	Tons.
Staffordshire ..	95	216,000	Derbyshire ..	14	20,500
Shropshire ..	31	78,000	All Scotland ..	18	36,500
South Wales ..	90	272,000			
North Wales ..	12	24,000	Total ..	284	690,000
Yorkshire ..	24	43,000			

In 1830, Great Britain produced, by 376 furnaces, 677,417 tons; and in 1840, by 402 furnaces, 1,396,400 tons, as follows:—

	Furnaces.	Tons.		Furnaces.	Tons.
South Wales ..	132	505,000	Forest of Dean ..	4	15,500
Staffordshire ..	123	427,650	Northumberland ..	5	11,000
Shropshire ..	24	82,750	All Scotland ..	64	241,000
Yorkshire ..	25	56,000			
Derbyshire ..	13	31,000	Total ..	402	1,396,400
North Wales ..	12	26,500			

By 162 hot-blast furnaces .. .. Tons 625,000  
 240 cold-blast ditto .. .. 771,400

402 furnaces.

Tons .. 1,396,400

Scotland alone produced:—

In 1845, by 94 furnaces, as near as could be calculated ..	Tons 500,000
1846, by 97 ditto ditto ..	520,000
1847, by 89 ditto ditto ..	500,000
1848, by 103 ditto ditto ..	590,000
1849, by 113 ditto ditto ..	690,000

Or a quantity equal to the production of Great Britain in 1827, by 284 furnaces.

## ANNUAL OUTPUT PER FURNACE.

1740, average production per furnace per annum ..	Tons 294
1796, ditto ditto ditto ..	1,033
1827, ditto ditto ditto ..	2,429
1840, ditto ditto ditto ..	3,473
1849, ditto ditto ditto ..	6,106

NUMBER of FURNACES and MAKE of IRON in ENGLAND, SCOTLAND,  
and WALES, in the Year 1866.

## STAFFORDSHIRE.

Name of Works.	Furnaces.			Make per Year.	Owners.
	In.	Out.	Total.		
Apedale .. ..	1	—	1	1,400	G. Parker & Co.
Silverdale .. ..	1	—	1	1,010	R. Sneyd.
Golden Hill .. ..	1	—	1	184	Banks & Co.
Level .. ..	2	1	3	3,351	Gibbons.
Brierley .. ..	—	2	2	—	Orrions.
Brierley Hill .. ..	1	—	1	817	Orrions.
Park Head .. ..	1	—	1	1,404	Parker.
Blowers Green .. ..	1	—	1	2,436	Gravebrook.
Netherton .. ..	1	1	2	1,500	Atwoods.
Gornal Wood .. ..	1	—	1	432	Banks.
Graveyard .. ..	1	1	2	1,274	Hawkes & Co.
Dibsdale Bank .. ..	1	—	1	300	Dixon.
Deepfield .. ..	2	—	2	3,660	Stokes.
Bilston .. ..	2	1	3	3,550	Birkley & Co.
Bradley .. ..	2	1	3	2,566	J. Wilkinson.
Capon Field .. ..	2	—	2	4,600	Smith, Read, & Co.
Rough Hill .. ..	2	—	2	3,000	Fereday & Co.
Mill Field .. ..	2	—	2	5,000	Fereday & Co.
Gospel Oak .. ..	2	—	2	4,667	Read.
Toll End .. ..	1	1	2	1,220	R. Hawkes.
Moorcroft .. ..	1	1	2	1,955	Addenbrook Estab.
Wednesbury .. ..	—	1	1	—	Atwood.
Dudley Port .. ..	1	—	1	1,196	Parkes.
Oldbury .. ..	1	—	1	4,500	Barker.
Tipton .. ..	2	—	2		Barker.
	32	10	42	50,002	

## CUMBERLAND.

Bearpot or Seaton .. ..	1	—	1	670	Barker.
Duddon .. ..	1	—	1	325	Mitchell & Co.
Newland .. ..	1	—	1	200	Knott & Co.
Backbarrow .. ..	1	—	1	760	Mitchell & Co.
	4	—	4	1,955	

## DERBYSHIRE.

Dale Abbey .. ..	—	2	2	—	A. Raby.
Morley Park .. ..	1	—	1	420	Francis Hurst.
Butterly .. ..	2	—	2	1,766	Outran & Co.
Chesterfield .. ..	2	—	3	1,700	Smith & Co.
Duckmanton .. ..	1	1	2	900	Smith & Co.
Wingerworth .. ..	1	1	2	819	J. Butler.
Staveley .. ..	1	—1	1	596	Lowe Ward. [ & Co.
Alfreton .. ..	1	—	1	1,450	Saxley, Edwards,
Hasland .. ..	1	—	1	723	J. Brocksop.
Chesterfield .. ..	1	1	2	700	Top & Co.
	11	6	17	9,074	

## FURNACES and MAKE of IRON in the year 1806—(continued).

## SHROPSHIRE.

Name of Works.	Furnaces.			Make per Year.	Owners.
	In.	Out.	Total.		
Cornbrook .. ..	1	—	1	292	T. W. B. Bolfield.
Clee Hill .. ..	1	—	1	303	George & Co.
Old Park .. ..	4	—	4	8,359	Bolfield.
Horse Hay .. ..	2	—	2	3,834	Dale & Co.
Colebrook Dale ..	2	—	2	2,962	Dale & Co.
Light Moor .. ..	3	—	3	5,601	Addenbrook.
Madeley Wood.. ..	2	—	2	2,951	Reynolds.
Benthal .. ..	1	—	1	1,294	Harris.
Wiley .. ..	—	1	1	—	J. Wilkinson.
Broseley .. ..	1	—	1	1,450	Banks & Co.
Kitley .. ..	2	2	4	7,510	Reynolds.
Billingsley .. ..	—	2	2	—	Stoke.
Queen's Wood .. ..	1	—	1	2,605	Reynolds.
Snedshill .. ..	2	1	3	3,950	Bishton.
Culcott .. ..	1	4	5	2,269	Brodie & Co.
Barnets Lason .. ..	1	1	2	574	Jesson.
Donnington Wood ..	2	1	3	3,400	Bishton.
Rockwarden .. ..	2	—	2	4,000	Bishton.
New Hadley .. ..	2	—	2	3,612	J. Wilkinson.
	30	12	42	54,966	

## LANCASHIRE.

Leighton .. ..	1	—	1	780	Earl Balcarras.
Haigh .. ..	—	2	2	—	
	1	2	3	780	

## LEICESTERSHIRE.

Ashby .. ..	—	1	1	—	Lord Moira.
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## NORTHUMBERLAND.

Newcastle-upon-Tyne	2	—	2	2,500	Bulmer & Co.
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## YORKSHIRE.

Sheffield Park .. ..	1	—	1	1,905	Booth & Co.
Chapel Town .. ..	1	2	3	3,737	Swallow & Co.
Tbornccliffe .. ..	2	—	2	2,500	Chambers & Co.
Bowling .. ..	2	1	3	2,473	Sturges & Co.
Low Moor .. ..	4	—	4	5,143	Jarratt & Co.
Shelf .. ..	2	1	3	2,716	Haydon & Co.
Birkenshaw .. ..	1	—	1	612	Emmett & Co.
Rennishaw .. ..	1	—	1	975	Appleby & Co.
Elsecar .. ..	2	—	2	2,495	Darwen & Co.
Bretton .. ..	1	—	1	250	Cook & Co.
Holmes and Milton ..	3	—	3	3,000	Walkers.
Calden .. ..	1	—	1	1,040	Emmett.
Fieldhead .. ..	1	—	1	800	Parker.
	22	4	26	27,646	

## MONMOUTHSHIRE.

Abbey Tintern .. ..	1	—	1	987	Thompson.
Bishop's Wood.. ..	1	—	1	653	Partridge & Co.
Pontypool .. ..	1	—	1	600	Leigh.
	3	—	3	2,240	

## FURNACES and MAKE of IRON in the year 1806—(continued).

## SOUTH WALES.

Name of Works.	Furnaces.			Make per Year.	Owners.
	In.	Out.	Total.		
Clydack .. ..	1	1	2	2,802	Frere, Cook, & Co.
Blandare .. ..	—	1	1	—	Barnaly.
Blaenavon .. ..	3	1	4	7,846	Hill & Hopkins.
Sirhowy .. ..	2	—	2	3,700	Fothergill & Co.
Ebbwvale .. ..	1	1	2	3,664	Harford & Co.
Beaufort .. ..	2	—	2	4,696	Kendale & Co.
Tredeggar .. ..	2	—	2	4,500	S. Homphray & Co.
Hirwain .. ..	1	—	1	500	Bowger & Co.
Nanteglo .. ..	—	2	2	—	Hill & Co.
Aberdare .. ..	2	—	2	3,586	Scales & Co.
Abernant .. ..	1	1	2	4,376	Tapperton.
Melincourt .. ..	1	—	1	1,000	Myers.
Varteg .. ..	1	—	1	1,000	Knight & Co.
Ennisyddin .. ..	1	—	1	1,000	Parsons.
Neath Abbey .. ..	—	2	2	—	Foxes & Co.
Carphilly .. ..	1	—	1	1,000	Harford & Co.
Penruton .. ..	—	1	1	—	Raby.
Cyfarthfa .. ..	4	—	4	9,000	R. Crawshay.
Plymouth .. ..	3	—	3	5,000	R. Hill & Son.
Pennydarrow .. ..	3	—	3	6,780	S. Homphray & Co.
Dowlais .. ..	3	—	3	6,000	Tail.
Llanelly .. ..	2	—	2	2,267	A. Raby.
Dowey .. ..	1	0	1	150	Kendalls.
	35	10	45	68,867	

## NORTH WALES.

Ruabon .. ..	1	—	1	1,463	Rowland & Co.
Brymbo .. ..	1	1	2	462	J. Wilkinson.
Carmarthen .. ..	1	—	1	1,056	—
	3	1	4	2,981	

## SCOTLAND.

## LINLITHGOWSHIRE.

Carrow .. ..	5	—	5	7,380	Carrow & Co.
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## LANARKSHIRE.

Wilson Town .. ..	1	1	2	1,381	Wilson.
Muirkirk .. ..	2	1	3	3,043	Robertson & Co.
Clyde .. ..	2	1	3	2,687	Caddel & Co.
Omoa .. ..	2	1	3	1,852	Dalrymple.
Calder .. ..	1	1	2	1,077	Dixon & Co.
Glenbuck .. ..	1	—	1	790	Dixon & Co.
Shotts .. ..	1	—	1	2,034	Logan & Co.
	10	5	15	12,864	

## CLACKMANNAN.

Devon .. ..	2	—	2	2,596	Gordon & Co.
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## ARGYLESIRE.

Argyle .. ..	—	2	2	—	—
Borrow .. ..	1	—	1	—	—
	1	2	3		

## FIFESHIRE.

Marknech .. ..	—	2	2	—	Losh & Co.
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## FURNACES and MAKE of IRON in the year 1806—(continued).

## TOTAL.

Name of Works.	Furnaces.			Tons per year.
	In.	Out.	Total.	
Staffordshire .. .. .	32	10	42	50,002
Cumberland .. .. .	4	—	4	1,955
Derbyshire .. .. .	11	6	17	9,074
Shropshire .. .. .	30	12	42	54,966
Lancashire .. .. .	1	2	3	780
Leicestershire .. .. .	—	1	1	—
Northumberland .. .. .	2	—	2	2,500
Yorkshire .. .. .	22	4	26	27,646
Monmouthshire .. .. .	3	—	3	2,240
North Wales .. .. .	3	1	4	2,981
South Wales .. .. .	35	10	45	68,867
Scotland .. .. .	18	9	27	22,840
Total .. .. .	161	55	216	243,851

## NUMBER of FURNACES and MAKE of IRON in GREAT BRITAIN in the Year 1848.

## STAFFORDSHIRE.

Name of Works.	Furnaces.			Make per Year.	Owners.
	In.	Out.	Total.		
Lane End .. .. .	2	1	3	8,320	Sparrow.
Etruria .. .. .	2	1	3	7,280	Lord Granville.
Kidd's Grove .. .. .	3	—	3	13,520	Kinnersley.
Tunstall .. .. .	2	—	2	6,240	Williamsons.
Apedale .. .. .	4	—	4	18,720	Heathcote.
Madely .. .. .	1	1	2	4,160	Firmstone.
Silverdale .. .. .	2	—	2	7,280	R. Sneyd.
	16	3	19	65,520	
Darlaston .. .. .	1	1	2	—*	Addenbrook & Co.
Bilston .. .. .	1	1	2	—	Baldwin & Co.
Gold's Green .. .. .	2	1	3	—	Bagnall & Sons.
Darlaston Green .. .. .	1	—	1	—	Bills & Mills.
Ellingshall .. .. .	1	1	2	—	Banks & Son.
Dudley W. & Northerton	2	4	6	—	British Iron Co.
Corngreaves .. .. .	2	—	2	—	British Iron Co.
Withygrove .. .. .	1	1	2	—	Best & Bars.
Russell Hall .. .. .	3	—	3	—	Blackwell & Co.
Woodside .. .. .	1	1	2	—	Cochrane & Co.
Tipton .. .. .	1	1	2	—	Creswell & Sons.
Horsley Hole .. .. .	2	—	2	—	Chillington & Co.
Wolverhampton .. .. .	2	1	3	—	Dixon, Nevi, & Co.
Crookhay .. .. .	3	—	3	—	Daws & Sons.
Oldbury .. .. .	—	2	2	—	Daws & Sons.
Parkhead .. .. .	1	1	2	—	Evers & Martin.

\* Average make of each furnace, 4,160 tons per year.

## FURNACES and MAKE of IRON in the year 1848—(continued).

## STAFFORDSHIRE—(continued).

Name of Works.	Furnaces.			Make per Year.	Owners.
	In.	Out.	Total.		
Pelsull .. ..	1	1	2	—*	R. Fryer.
Lays .. ..	2	1	3	—	W. & G. Firmstone
Shutend .. ..	3	1	4	—	J. Foster.
Netherton .. ..	1	1	2	—	M. & W. Grazebrook
Corbyn's Hall .. ..	2	2	4	—	Malins & Co.
Horseley .. ..	2	—	2	—	J. Hartland.
Dudley Port .. ..	1	—	1	—	J. Hopkins.
Buffery .. ..	—	1	1	—	J. Haden.
Level .. ..	1	1	2	—	W. Igons & Co.
Chillington .. ..	3	1	4	—	Barker & Foster.
Coseley .. ..	2	—	2	—	G. Jones.
New Duffield .. ..	2	1	3	—	G. Jones.
New Birchills .. ..	—	2	2	—	G. Jones.
Ketley .. ..	—	3	3	—	Jones & Oaks.
Bentley .. ..	—	4	4	—	Earl of Lichfield.
Wednesbury .. ..	1	1	2	—	Loyds, Foster, & Co.
Park Lane .. ..	1	—	1	—	T. Morris.
Oak Farm .. ..	2	2	4	—	Oak Farm Co.
Parkfields .. ..	3	1	4	—	Parkfield Co.
Bilston Brook .. ..	—	2	2	—	J. Parson.
Coseley .. ..	2	1	3	—	Pemberton & Co.
Millfield .. ..	2	1	3	—	W. Riley.
Slowheath .. ..	—	5	5	—	W. & J. Sparrow.
Osier Bed .. ..	2	1	3	—	W. & J. Sparrow.
Willingsworth .. ..	1	2	3	—	Sir H. St. Paul.
Waterloo .. ..	1	1	2	—	Sir H. St. Paul.
Windmill .. ..	—	2	2	—	Sir H. St. Paul.
Cappon Field .. ..	2	1	3	—	J. Bagnall & Sons.
Birchills .. ..	1	—	1	—	E. Tyler.
Priestfields .. ..	2	1	3	—	W. W. Priestfield.
Bradley .. ..	1	—	1	—	Trusts of J. Wilkin.
Wednesbury Oak .. ..	3	—	3	—	Williams & Sons.
Union .. ..	2	1	3	—	Williams & Sons.
Coneyqu .. ..	1	2	3	—	Lord Ward.
Level .. ..	1	2	3	—	Lord Ward.
Bilston .. ..	1	—	1	—	Woolley & Co.
Prior's Field .. ..	2	1	3	—	H. B. Whitehouse.
Brettle Lane .. ..	1	1	2	—	J. & W. Wheely.
Corbyn's Hall .. ..	2	—	2	—	B. Gibbons.
Meadow Furnace .. ..	1	—	1	—	Hall, Holcroft, & Co.
	77	62	139		
YORKSHIRE.					
Low Moor .. ..	5	1	6	14,560	Hird, Dauson, & Co.
Bierly .. ..	3	1	4	8,320	Clayton & Co.
Bowling .. ..	4	1	5	10,400	Sturgess & Co.
Waterloo .. ..	1	—	1	2,340	Fenton.
Farnley .. ..	1	1	2	2,600	Armitage.
Worsbro' .. ..	1	—	1	2,600	Field, Cooper, & Co.
Thorncliffe .. ..	2	—	2	6,750	Chambers & Co.
Chapel Town .. ..	2	—	2	5,200	Schofield & Co.
Park Gate .. ..	1	—	1	5,200	Schofield & Co.
Elsecar .. ..	1	1	2	2,340	Lord Fitzwilliam.
Milton .. ..	2	—	2	6,240	Graham.
	23	5	28	66,560	

\* Average make of each furnace, 4,160 tons per year.

## FURNACES and MAKE of IRON in the year 1848—(continued).

## DERBYSHIRE.

Name of Works.	Furnaces.			Make per Year.	Owners.
	In.	Out.	Total.		
Butterley Hall .. ..	3	—	3	9,880	Butterley Co.
Codnor Park .. ..	3	—	3	10,920	Butterley Co.
Alfreton .. ..	3	—	3	6,240	Oakes & Co.
Morley Park .. ..	2	—	2	4,680	Mold & Co.
Wengerworth .. ..	2	1	3	10,400	Yates & Co.
Clay Cross .. ..	—	2	2	8,320	Stephenson & Co.
Starley .. ..	3	1	4	8,840	Barrow.
Renishaw .. ..	1	1	2	4,680	Appleby & Co.
Newbold .. ..	—	1	1	4,160	Schofield & Co.
Adelphi .. ..	—	2	2	8,320	Elsom & Co.
Stanton .. ..	3	—	3	10,400	Smith & Co.
West Hallam .. ..	—	2	2	8,320	Whitehouse.
	20	10	30	95,160	

## SHROPSHIRE.

Madeley Wood Co. ..	2	1	3	7,280	—
Colebrook Dale Co. ..	8	—	8	24,960	—
Old Park Iron-works ..	6	2	8	18,720	W. & B. Bolfield.
Langley Co. .. ..	1	1	2	3,120	—
Lilleshall Co. .. ..	6	1	7	18,720	—
— .. ..	3	—	3	9,360	J. Foster.
Ketley Co. .. ..	2	1	3	6,240	—
	28	6	34	88,400	

## NORTHUMBERLAND, &amp;c.

Consett and Crook Hall	7	7	14	29,120	Derwent Iron Co.
Birtley Works .. ..	2	1	3	8,320	Birtley Iron Co.
Walker Works .. ..	2	—	2	8,320	Losh, Wilson, & Co.
Wylam Works .. ..	1	—	1	4,160	Bell, Brothers.
Tyne Works .. ..	2	—	2	8,320	Tyne Iron Co.
Hareshaw Works .. ..	2	1	3	8,320	—
Redesdale Works .. ..	2	1	3	8,320	Redesdale Iron Co.
Tow Law Works .. ..	2	1	3	8,320	Weardale Iron Co.
Stanhope .. ..	1	—	1	4,160	Weardale Iron Co.
Witton Park Co. .. ..	3	1	4	12,480	—
	24	12	36	99,840	

## SCOTLAND.

Gartsherrie .. ..	16	—	16	— *	Wm. Baird & Co.
Dundyvan .. ..	8	1	9	—	John Wilson.
Clyde .. ..	5	2	7	—	C. Dunlop & Co.
Govan .. ..	4	2	6	—	Wm. Dixon.
Calder .. ..	3	5	8	—	Wm. Dixon.
Langloan .. ..	5	1	6	—	Addie, Miller, & Co.
Carnbroe .. ..	3	3	6	—	Merry & Co.
Glengarnock .. ..	6	1	7	—	Merry & Co.
Summerlee .. ..	5	1	6	—	Wilsons & Co.
Monkland .. ..	9	—	9	—	Monkland Iron Co.
Coltness .. ..	4	2	6	—	Coltness Iron Co.
Omoo .. ..	4	—	4	—	R. Stewart.

\* Average make of each furnace, 6,000 tons per year.

## FURNACES and MAKE of IRON in the year 1848—(continued).

## SCOTLAND—(continued).

Name of Works.	Furnaces.			Make per Year.	Owners.
	In.	Out.	Total.		
Shotts .. ..	3	1	4	—*	Shotts Iron Co.
Castlehill .. ..	2	1	3	—	Shotts Iron Co.
Blair .. ..	—	5	5	—	Ayrshire Iron Co.
Muirkirk .. ..	—	4	4	—	Muirkirk Iron Co.
Garscube .. ..	—	2	2	—	John Watson.
Carron .. ..	3	1	4	—	Carron Iron Co.
Devon .. ..	1	—	1	—	Devon Iron Co.
Forth .. ..	4	2	6	—	Forth Iron Co.
Kinneil .. ..	4	—	4	—	John Wilson.
Lugar .. ..	—	4	4	—	Lugar Iron Co.
Eglinton.. ..	—	3	3	—	Wm. Baird & Co.
	89	41	130	—	

## NORTH WALES.

Coad Talon .. ..	1	—	—	1,560	—
Brymbo .. ..	2	—	—	6,240	—
British Company .. ..	1	—	—	5,200	—
Platisa .. ..	1	—	—	3,120	—
	5	—	—	16,120	

## SOUTH WALES.

Cwm Brain .. ..	1	—	1	—†	R. J. Blewitt.
Pontypool & Blacadare	1	3	4	—	C. H. Leigh.
Pentwyn Golynos & Var	5	3	8	—	Williams & Co.
Aberyschan .. ..	4	2	6	—	British Iron Co.
Blainafon .. ..	4	1	5	—	Blainafon Iron Co.
Clydach .. ..	4	—	4	—	Powell & Co.
Naty Glog and Beaufort	12	2	14	—	J. & J. Bailey.
Coalbrook Vale.. ..	1	1	2	—	Brewer & Co.
Blaina and Cwn Celyn..	4	2	6	—	Crutluwell & Co.
Ebbw Vale & Sir Howy	8	1	9	—	Dailey & Co.
Victoria .. ..	2	2	4	—	Joint Stock.
Tredegar .. ..	7	—	7	—	Tredegar Iron Co.
Rhymney .. ..	9	1	10	—	Rhymney Iron Co.
Dowlais .. ..	18	—	18	—	Guest & Co.
Penydarra .. ..	6	1	7	—	Thompson & Co.
Cyfartha Ynystack and } Herwain	13	2	15	—	W. Crawshay.
Plymouth and Duffrin..	7	1	8	—	A. Hill.
Gadlys .. ..	1	1	2	—	Wayne & Co.
Aberdare and Abernant	6	—	6	—	Thompson & Co.
Pentyrch .. ..	1	1	2	—	T. W. Booker.
Penalt .. ..	2	—	2	—	Iwons & Co.
Neath Abbey .. ..	2	—	2	—	J. Price.
Cwm Avon .. ..	6	1	7	—	Copper Mining Co.
Onllwyn .. ..	2	—	2	—	John Williams.
Llynvi .. ..	1	2	3	—	Joint Stock.
Toudee .. ..	1	1	2	—	Sir R. Price.
Amwain .. ..	2	—	2	—	Llewellyn & Co.
Cefr Cwse and Garth ..	2	3	5	—	Maling & Co.
Llandare .. ..	1	—	1	—	Sir John Norris.

\* Average make of each furnace, 6,000 tons per year.

† Average make of each furnace, 4,680 tons per year.



## FURNACES and MAKE of IRON in the year 1848—(continued).

## SOUTH WALES—(continued).

Name of Works.	Furnaces.			Make per Year.	Owners.
	In.	Out.	Total.		
Banwen .. ..	—	2	2	— *	Joint Stock.
Ystalyfera .. ..	6	5	11	—	Ystalyfera Iron Co.
Yniscedwyn .. ..	5	2	7	—	Crane & Co.
Maesteg .. ..	2	1	3	—	Maesteg Iron Co.
Millbrook .. ..	1	—	1	—	Millbrook Iron Co.
Cambrian .. ..	2	1	3	—	Cambrian Iron Co.
Gwenebriath .. ..	2	1	3	—	Walneg & Co.
Trulsarran .. ..	—	2	2	—	Nartch & Co.
	151	45	196	—	

\* Average make of each furnace, 4,680 tons per year.

## TOTAL.

Name of Works.	Furnaces.			Make per Year.
	In.	Out.	Total.	
North Staffordshire .. ..	16	3	19	65,520
South Staffordshire .. ..	77	62	139	320,320
Yorkshire .. ..	23	5	28	66,560
Derbyshire .. ..	20	10	30	95,160
Shropshire .. ..	28	6	34	88,400
Northumberland .. ..	24	12	36	99,840
Scotland .. ..	89	41	130	539,962
North Wales .. ..	5	6	11	16,120
South Wales .. ..	151	45	196	706,680
Total .. ..	433	190	623	1,993,568

## COMPARATIVE STATEMENT of the NUMBER of FURNACES and MAKE of IRON in the Years 1806 and 1848.

Name of Works.	Furnaces.						Make per Year.	
	In.		Out.		Total.		1806.	1848.
	1806.	1848.	1806.	1848.	1806.	1848.		
Staffordshire ..	32	93	10	65	42	158	50,092	385,840
Yorkshire ..	22	23	4	5	26	28	27,646	66,560
Derbyshire ..	11	20	6	10	17	30	9,074	95,160
Shropshire ..	30	28	12	6	42	34	54,966	88,400
Northumberland ..	2	24	—	12	2	36	2,500	99,840
Cumberland ..	4	—	—	—	4	—	1,955	—
Lancashire ..	1	—	2	—	3	—	780	—
Leicestershire ..	—	—	1	—	1	—	—	—
Monmouthshire ..	3	—	—	—	3	—	2,240	—
Scotland ..	18	89	9	41	27	130	22,840	539,968
North Wales ..	3	5	1	6	4	11	2,981	16,120
South Wales ..	35	151	10	45	45	196	68,867	706,680
Total ..	161	433	55	190	216	623	243,851	1,998,558

The following Return of Furnaces in the respective years of 1806 and 1848, shows an increase of 407 furnaces, with a make of 1,754,717 tons:—

Year.	In.	Out.	Total.	Make.
January, 1806 ..	161 ..	55 ..	216 ..	243,851
January, 1848 ..	433 ..	190 ..	623 ..	1,998,568
Increase ..	272 ..	135 ..	407 ..	1,754,717

#### SCOTLAND TRADE.

Years.	In Blast.	Out of Blast.	Total Furnaces.
1788 .. ..	8 ..	— ..	8 ..
1796 .. ..	17 ..	— ..	17 ..
1823 .. ..	22 ..	— ..	22 ..
1830 .. ..	27 ..	— ..	27 ..
1846 .. ..	97 ..	25 ..	122 ..
1847 .. ..	89 ..	43 ..	132 ..
1848 .. ..	103 ..	36 ..	139 ..
1849 .. ..	113 ..	31 ..	144 ..

The two furnaces first erected were the Goatfield and Bunawe (charcoal); of the working of which, however, we have no record after 1796; the next, the Wilsontown, was discontinued in 1830. The most important is the Gartsherrie Company, which commenced in 1846, with 14 furnaces in blast and 2 building = 16, which have continued until the present period.

#### PIG-IRON WORKS AND FURNACES, 1849.

Name of Works.	Proprietors.	Furnaces.	In.	Out.	Building.
Gartsherrie ..	Wm. Baird and Co. ..	16	6	—	—
Dundyan ..	John Wilson ..	9	8	1	—
Clyde ..	C. Dunlop & Co. ..	7	6	1	—
Calder ..	Wm. Dixon ..	8	5	3	—
Govan ..	Ditto ..	6	4	2	—
Monkland ..	Monkland Iron & Steel Co. ..	9	9	—	—
Carnbro' ..	Merry & Cunningham ..	6	3	3	—
Summerlee ..	Wilson & Co. ..	6	6	—	—
Coltness ..	Coltness Iron Company ..	6	6	—	—
Langloan ..	Addie, Miller, & Rankin ..	6	6	—	—
Carron ..	Carron Company ..	5	2	3	—
Muirkirk ..	Dunlop, Wilson, & Co. ..	3	1	2	—
Shotts ..	Shotts Iron Company ..	4	4	—	—
Glengarnock ..	Merry & Cunningham ..	9	9	—	—
Omoa ..	Robert Stewart ..	4	1	—	—
Devon ..	Wilson & Christie ..	5	4	1	—
Blair ..	Ayrshire Iron Company ..	5	—	5	—
Garscube ..	John Watson ..	2	—	2	—
Castlehill ..	Shotts Iron Company ..	3	2	1	—
Forth ..	Forth Iron Company ..	6	4	1	1
Kirmell ..	John Wilson ..	4	4	—	—
Lugar ..	Ditto ..	4	4	—	—
Eglinton ..	Wm. Baird & Co. ..	4	3	1	—
Dalmellington ..	Dalmellington Iron Company ..	3	3	—	—
Portland ..	Portland Iron Company ..	2	2	—	—
Nithsdale ..	Nithsdale Iron Company ..	3	—	—	3
Lochgelly ..	Lochgelly Iron Company ..	2	1	1	—
Totals ..	.. ..	144	113	27	4

Each furnace producing, on an average, 6,000 tons per annum; the greater number, however, *actually* putting out *upwards* of 7,000 tons.

## FURNACES IN SOUTH WALES, 1849.

Name of Works.	Proprietors.	In.	Out.	Total.	Name of Valley where the work is situated.
Cwm Brain .. .. .	R. J. Blewitt.. ..	1	0	1	Pontypool Valley.
Pentwyn, Golynos, & Varteg	Williams & Co. ..	7	1	8	Ditto.
Aberyschan .. .. .	N. British Iron Co...	3	3	6	Ditto.
Blaenavon .. .. .	Blaenavon Iron Co...	4	1	5	Ditto.
Pontypool .. .. .	C. H. Leigh, Esq. ..	2	1	3	Ditto.
Clydach .. .. .	Powell & Co. ..	4	0	4	Ditto.
Nantyglo and Beaufort	Messrs. Bailey ..	14	0	14	Blaina.
Coalbrook Vale .. ..	Messrs. Brewer & Co.	5	0	5	Ditto.
Blaina and Cwm Celyn	Messrs. Crutwell ..	3	3	6	Ditto.
Ebbw Vale .. .. .	Messrs. Darby & Co.	4	0	4	Ebbw.
Sirhowy .. .. .	Ditto .. ..	4	1	5	Sirhowy.
Victoria .. .. .	Ditto .. ..	2	2	4	Ebbw.
Tredegar .. .. .	Tredegar Iron Co. ..	7	0	7	Sirhowy.
Rhymney .. .. .	Rhymney Iron Co. ..	9	1	10	Rhymney.
Dowlais and Ifor .. ..	Sir J. J. Guest & Co.	16	2	18	Taff.
Pen-y-darren .. .. .	Thompson & Co. ..	5	2	7	Ditto.
Plymouth, or Furnace } " Ishaf, and Duffryn }	A. Hill & Co. ..	8	0	8	Ditto.
Ynys Fach .. .. .	W. Crawshay, Esq... ..	4	0	4	Ditto.
Cyfarthfa .. .. .	Crawshay & Co. ..	16	1	11	Ditto.
Pentyrch .. .. .	T. Booker, Esq. ..	1	1	2	Ditto.
Hirwain .. .. .	Crawshay & Co. ..	4	0	4	Aberdare.
Aberdare and Abernant	Fothergill & Co. ..	5	1	6	Ditto.
Gadly's .. .. .	Wayne & Co. ..	1	1	2	Ditto.
Aberaman .. .. .	C. Bailey, Esq. ..	2	0	2	Ditto.
Tonddu .. .. .	Sir R. Price ..	1	1	2	Llynfi.
Cefn Cwse .. .. .	H. Scale, Esq. ..	1	2	3	Ditto.
Garth .. .. .	Messrs. Scale ..	0	3	3	Ditto.
Maesteg .. .. .	Maesteg Iron Co. ..	0	3	3	Ditto.
Llwyni .. .. .	Cambrian Iron Co. ..	2	2	4	Ditto.
Cefn Crib .. .. .	— .. ..	0	1	1	Ditto.
Oakwood and Amwain	W. Llewellyn, Esq. ..	5	0	5	Ditto.
Cwmafon .. .. .	Cop. Miners of Eng..	4	0	4	Avon Valley.
Penallt .. .. .	Jevons & Co... ..	0	2	2	Neath.
Neath Abbey.. .. .	Neath Abbey Iron Co.	0	2	2	Ditto.
Onllwyn .. .. .	J. Williams, Esq. ..	2	0	2	Swansea.
Millbrook, or Landore	Sir J. Morris ..	0	2	2	Ditto.
Ystalyfera .. .. .	Ystalyfera Iron Co. ..	4	7	11	Ditto.
Ynyscedwyn .. .. .	Ynyscedwyn Iron Co.	5	2	7	Ditto.
Banwen .. .. .	Banwen Company ..	0	2	2	Ditto.
Truisarran .. .. .	Martole & Co. ..	0	2	2	Amman.
Gwaindraith .. .. .	Walvey & Co. ..	1	2	3	Ditto.
Amman .. .. .	— .. ..	2	0	2	Ditto.
Total .. .. .	.. .. .	149	54	203	

FURNACES IN SOUTH STAFFORDSHIRE AND WORCESTERSHIRE,—  
1849.

Names of Works.	Proprietors.	In.	Out.	Total.
Oldbury .. .. .	John Dawes & Sons ..	2	0	2
Union .. .. .	P. Williams & Sons ..	2	1	3
Ridgacre .. .. .	— Fowler .. ..	0	0	0
Crookhay .. .. .	Thomas Davies .. ..	2	1	3
Goldshil .. .. .	Bagnall & Sons .. ..	3	0	3
Toll End .. .. .	Eagle Furnace Co. ..	0	0	0

## FURNACES IN STAFFORDSHIRE AND WORCESTERSHIRE—(continued).

Names of Works.	Proprietors.	In.	Out.	Total.
Toll End .. .. .	Birmingham Coal Co. .. ..	0	0	0
Old Park .. .. .	Lloyds, Foster, & Co. .. ..	1	1	2
Wednesbury Oak.. ..	P. Williams & Sons .. ..	3	0	3
Wellingsworth .. ..	Haines & Co. .. ..	2	1	3
Broadwaters .. .. .	Colburn, Growcott, & Co. ..	2	0	2
Bentley Heath .. ..	E. of Lichfield .. ..	0	4	4
Old Birch Hills .. ..	P. Williams & Sons .. ..	1	0	1
Coltham .. .. .	John Mainwaring .. ..	0	0	0
Pelsall .. .. .	Wm. Fryer .. ..	1	1	2
Darlaston .. .. .	Mills & Co. .. ..	1	0	1
New Darlaston .. ..	Addenbrook & Co. .. ..	2	0	2
Dudley Port .. .. .	Thomas Morris .. ..	1	0	1
Ditto .. .. .	— Hopkins .. ..	2	0	2
Coneygree .. .. .	L. Ward .. ..	0	3	3
Horsley .. .. .	Horsey & Co. .. ..	2	0	2
Tipton .. .. .	E. Cresswell & Sons .. ..	0	2	2
Prior Fields .. .. .	H. B. Whitehouse .. ..	2	1	3
Deep Fields .. .. .	Benton & Pemberton .. ..	2	1	3
Capon Field .. .. .	John Bagnall & Sons .. ..	2	1	3
Eltingshall .. .. .	Thomas Banks & Son .. ..	1	1	2
Stone Fields (near Bilston)	E. Woolley (now T. W. Vernon)	1	0	1
Hall Fields .. .. .	B. Gibbons .. ..	1	0	1
Bilston Brook .. ..	John Parsons .. ..	0	2	2
Bonvereux .. .. .	Baldwin & Co. .. ..	1	1	2
Bilston .. .. .	George Jones .. ..	2	1	3
Coseley .. .. .	Turley, Brothers .. ..	1	1	2
Millfields .. .. .	W. Riley .. ..	3	0	3
Park Fields .. .. .	Parkfield Co. .. ..	3	1	4
Priest Fields .. .. .	W. Ward .. ..	2	1	3
Stow Heath .. .. .	W. Sparrow .. ..	3	2	5
Osier Bed .. .. .	— .. ..	2	1	3
Chillington .. .. .	Chillington Co. .. ..	4	0	4
Netherton .. .. .	M. & W. Grazebrook .. ..	1	1	2
Dudley Wood .. .. .	B. I. Co. .. ..	1	3	4
Bumble Hole, Netherton Works	Ditto .. ..	1	1	2
Corngreaves .. .. .	Ditto .. ..	1	1	2
Buffery .. .. .	Jones & Oakes .. ..	0	0	0
Ketley's .. .. .	Ditto .. ..	0	3	3
Russell's Hall .. ..	Blackwell .. ..	2	1	3
Dixon's Green .. ..	Joseph Hadden .. ..	1	0	1
Windmill End .. ..	W. Hadden .. ..	1	1	2
Withymoor .. .. .	Best & Bans .. ..	0	2	2
Parkhead .. .. .	Evers & Martin .. ..	1	1	2
Corbyn's Hall, New Furnaces	Benjamin Gibbons .. ..	4	0	4
Ditto Old ditto.. ..	Gal. Iron Co. .. ..	0	4	4
Level Iron-Works .. ..	L. Ward .. ..	0	3	3
Old Level .. .. .	John Lyon .. ..	1	1	2
Brettell Lane .. .. .	John Wheeley & Co. .. ..	0	2	2
Jay's Works .. .. .	W. & G. Firmstone .. ..	3	0	4
Shut End .. .. .	John Bradley & Co. .. ..	4	0	4
Oak Farm .. .. .	Oak Farm Co. .. ..	0	2	2
Woodside .. .. .	Bramah & Cochrane .. ..	1	1	2
Wolverhampton .. ..	Dixon .. ..	2	1	3
Moseley .. .. .	Chillington Iron Co. .. ..	2	1	2
New Birch Hills .. ..	George Jones .. ..	2	0	2
Old Hill.. .. .	T. & J. Badger .. ..	1	0	1
Tipton Green Old Furnaces	B. Gibbons, jun.. ..	1	1	2
Darlaston Green .. ..	David Jones .. ..	1	0	1
Bloxwich .. .. .	W. Fryer .. ..	1	0	1
Total .. .. .	.. .. .	89	58	147



## FURNACES—NEWCASTLE.

Name of Works.	Proprietors.	In.	Out.	Total.
Ridsdale .. .. .	Ridsdale Iron Co. .. ..	1	2	3
Hareshaw .. .. .	Hareshaw Iron Co. .. ..	—	—	3
Wylam .. .. .	Bell Brothers .. .. .	1	—	1
Walker .. .. .	Losh, Wilson, & Bell .. ..	2	—	2
Birtley .. .. .	Birtley Iron Co. .. ..	2	1	3
Tyne .. .. .	Tyne Iron Co. .. ..	1	1	2
Derwent and Shotley Bridge ..	Mounsey & Co. .. ..	5	9	14
Witton Park .. .. .	Bolckow & Vaughan .. ..	3	1	4
Weardale & Towlaw .. ..	Weardale Iron Co. .. ..	2	1	3

[We hope that some of our correspondents will favour us with returns from other places.]

## PRODUCTION OF MALLEABLE IRON.

1845—Estimated at	.. ..	Tons 35,000
1846 ditto	.. ..	45,000
1847 ditto	.. ..	60,000
1848 ditto	.. ..	90,000
1849 ditto	.. ..	80,000

## AVERAGE PRICE OF BAR IRON.

	£.	s.	d.		£.	s.	d.		£.	s.	d.
1813 .. .. .	13	6	8	1822 .. .. .	8	1	3	1831 .. .. .	5	13	9
1814 .. .. .	13	18	4	1823 .. .. .	8	0	0	1832 .. .. .	5	13	4
1815 .. .. .	13	13	4	1824 .. .. .	8	19	2	1833 .. .. .	6	12	11
1816 .. .. .	12	2	6	1825 .. .. .	12	14	2	1834 .. .. .	6	18	9
1817 .. .. .	10	12	6	1826 .. .. .	9	15	10	1835 .. .. .	6	10	0
1818 .. .. .	12	1	8	1827 .. .. .	9	7	6	1836 .. .. .	10	12	6
1819 .. .. .	12	5	0	1828 .. .. .	7	18	4	1837 .. .. .	9	1	3
1820 .. .. .	10	13	4	1829 .. .. .	6	16	8	1838 .. .. .	9	4	7
1821 .. .. .	8	18	4	1830 .. .. .	6	3	9	1839 .. .. .	9	15	0

## AVERAGE MONTHLY PRICES OF BAR-IRON

## FOR THE LAST TEN YEARS.

	1840.	1841.	1842.	1843.	1844.	1845.	1846.	1847.	1848.	1849.
	£.	£.	£.	£.	£.	£.	£.	£.	£.	£.
January ....	9	8	6½	5½	5	7½	10	9½	7½	5½
February ..	8½	8	6½	5½	5	8½	10	10	7½	6
March.....	8½	8	6½	5½	5½	9½	10	10½	7½	6½
April .....	8½	7½	6½	5½	6	10	10	10	7½	6½
May.....	8½	7½	5½	5½	6½	10	9½	10	7	6½
June .....	8½	7½	5½	5	6½	9	9½	10	7	6½
July.....	8	7	5½	5	6½	8½	9½	9½	6½	5½
August ....	7½	7	5½	4½	6½	8½	9½	9½	5½	5½
September..	8	7	6	5	6½	9	9½	9½	5½	5½
October ...	8½	6½	6	5	6½	10	9½	9½	5½	5½
November ..	8½	6½	6	5	6½	10	9½	9½	5½	5½
December ..	8½	6½	6	5	6½	10	8½	9½	5½	5½
Average..	8½	7½	5½	5½	6½	9½	9½	9½	6½	5½

Average—First 5 years, £6. 11s. 4d.; last 5 years, £8. 3s. 10d.; last 10 years, £7. 7s. 6d.

Rails .. ..	5s. to 7s. 6d. extra to prices of bars.
Sheets .. ..	40s. ditto.
Angle Iron ..	30s. ditto.
Hoops.. ..	40s. ditto.
Best Iron ..	25s. to 30s. per ton extra.

## AVERAGE AND COMPARATIVE VIEW OF PRICES OF PIG-IRON,

FOR THE LAST TWENTY YEARS.

1830 .. £5 0 0	1835 .. £4 10	1840 .. £3 15 0
1831 .. 4 10 0	1836 .. 6 15	1841 .. 3 0 0
1832 .. 4 10 0	1837 .. 4 0	1842 .. 2 10 0
1833 .. 4 0 0	1838 .. 4 0	1843 .. 2 16 0
1834 .. 4 5 0	1839 .. 4 10	

	1844.	1845.	1846.	1847.	1848.	1849.
January.. ..	£2 0 0	£3 5 0	£4 0 0	£3 13 4	£2 7 8	2 7 0
February ..	2 5 0	3 14 0	3 17 6	3 13 4	2 9 8	2 11 7
March .. ..	2 10 0	5 5 0	3 10 6	3 11 1	2 4 6	2 9 9
April .. ..	3 5 0	5 7 6	3 6 0	3 10 8	2 1 8	2 8 0
May .. ..	3 5 0	4 8 0	3 10 0	3 5 3	2 4 2	2 3 9
June .. ..	3 5 0	3 5 0	3 8 0	3 5 0	2 3 0	2 4 4
July .. ..	3 0 0	3 5 0	3 10 0	3 8 1	2 5 3	2 5 0
August .. ..	2 15 0	3 7 6	3 15 0	3 7 9	2 4 6	2 5 4
September ..	2 10 0	4 2 0	3 13 6	3 6 0	2 4 10	2 4 0
October .. ..	2 12 6	4 10 0	3 9 6	2 19 10	2 2 9	2 2 10
November ..	2 12 6	3 17 0	3 9 0	2 11 0	2 1 9	2 4 3
December ..	2 17 6	3 16 0	3 12 6	2 7 6	2 2 0	2 7 2
Average ..	£2 14 9	£4 0 3	£3 11 9	£3 5 0	£2 4 4	£2 6 1

Average price for the five years, 1840 to 1844	.. ..	59s. 2d.
Ditto .. ditto 1845 to 1849	.. ..	61s. 5d.
Ditto .. ten years, 1840 to 1849	.. ..	60s. 3d.

## EXPORT OF IRON FOR 1849.

	Tons.		Tons.
United States .. ..	94,212	Turkey—	
British America .. ..	7,235	Constantinople .. ..	525
South America .. ..	4,216	Egypt—	
Australia .. ..	965	Alexandria .. ..	125
China—			
Hong-Kong .. ..	70	Grand Total—	
Shanghai .. ..	145	Foreign .. ..	153,183
Germany, Holland, and Belgium	21,087	Coastwise .. ..	221,943
Italy .. ..	5,877		
Austria .. ..	865	Total tons .. ..	375,126
Jersey and Guernsey .. ..	280		
Denmark, Sweden, and Norway..	4,549	Shipped Foreign in 1849—	
France .. ..	8,453	From Scotland .. ..	88,423
Spain .. ..	2,534	„ Ireland .. ..	8,156
Portugal .. ..	822	„ England .. ..	56,604
West Indies.. ..	188		
East Indies .. ..	1,035	Total tons .. ..	153,183

# COMPARATIVE VIEW OF EXPORTS, STOCKS, PRODUCTION, AND PRICES,

FROM 1846, 1847, 1848, AND 1849.

		EXPORTS.			
		1849.	1848.	1847.	1846.
France .. .. .	Tons	8,453	5,859	24,836	35,567
Jersey and Guernsey .. ..	..	280	329	95	268
Germany, Holland, &c. ..	..	21,067	41,417	50,857	48,766
Denmark, Sweden, and Norway ..	..	4,549	7,054	3,416	2,580
Russia .. .. .	..	—	1,220	962	—
Turkey and Egypt .. .. .	..	650	911	531	260
Austria .. .. .	..	865	4,642	6,226	5,481
Italy .. .. .	..	5,877			
Spain .. .. .	..	2,534	1,444	1,703	2,703
Portugal .. .. .	..	822	535	283	435
South America .. .. .	..	4,216	1,980	1,343	538
West Indies .. .. .	..	188	161	215	170
Australia .. .. .	..	965	641	1,458	607
British America .. .. .	..	7,235	4,198	6,327	7,307
United States .. .. .	..	94,212	90,235	44,993	13,918
China .. .. .	..	215	575	175	—
East Indies .. .. .	..	1,035	950	—	—
Totals .. .. .	Tons	153,183	162,151	143,420	119,100
Coastwise .. .. .	..	221,943	227,833	227,005	257,851

STOCKS AND PRODUCTION.						Stock.	Production.
31st December, 1846	..	..	..	..	..	145,000	580,000
„ 1847	..	..	..	..	..	90,000	540,000
Decrease in 1847	..	..	..	..	..	55,000	40,000
31st December, 1848	..	..	..	..	..	100,000	600,000
„ 1847	..	..	..	..	..	90,000	540,000
Increase in 1848	..	..	..	..	..	10,000	60,000
31st December, 1849	..	..	..	..	..	195,000	692,000
„ 1848	..	..	..	..	..	100,000	600,000
Increase in 1849	..	..	..	..	..	95,000	92,000

					PRICES.			
					1846.	1847.	1848.	1849.
January .. ..	..	..	..	..	£4 0 0	£3 13 4	£2 8 4	£2 7 0
February .. ..	..	..	..	..	3 17 6	3 13 4	2 10 0	2 11 7
March .. ..	..	..	..	..	3 10 0	3 11 1	2 4 4	2 9 9
April .. ..	..	..	..	..	3 6 0	3 10 8	2 1 9	2 8 0

## COMPARATIVE VIEW OF EXPORTS, &amp;c.—(continued).

	PRICES.			
	1846.	1847.	1848.	1849.
May .. ..	3 10 0	3 5 3	2 2 3	2 3 9
June .. ..	3 8 0	3 5 0	2 3 0	2 4 4
July .. ..	3 13 0	3 8 1	2 5 6	2 5 0
August .. ..	3 15 0	3 7 9	2 5 3	2 5 4
September .. ..	3 13 6	3 6 0	2 5 3	2 4 0
October .. ..	3 9 6	2 19 10	2 3 0	2 2 10
November .. ..	3 9 0	2 11 0	2 2 0	2 4 3
December .. ..	3 12 6	2 7 6	2 2 4	2 7 6

Averages—1845: £3. 16s.—£3. 11s. 8d.—£3. 5s.—£2. 4s. 5d.—£2. 6s. 1d.

TABLE SHOWING THE QUANTITY OF SILVER AND NUMBER OF OUNCES IN THE TON BY ASSAY OF 400 GRAINS.

Quantity of Silver in sample.		Ounces to the Ton.	Per Centage.	Parts of the whole.
	grains	oz. dwt. gr.		
20		1,633 6 12	5½	1'20
19		1,551 13 8	4¾	21'65
18		1,470 0 0	4½	22'23
17		1,388 6 16	6¼	23'53
16		1,306 13 8	4	25
15		1,225 0 0	3¾	26'26
14		1,143 6 16	3½	28'57
13		1,061 13 8	3¼	30'76
12		980 0 0	3	33'33
11		898 6 16	2¾	36'36
10		816 13 8	2½	40
9		735 0 0	2¼	44'44
8		653 6 16	2	50
7		571 13 8	1¾	57'14
6		490 0 0	1½	66'66
5		408 6 16	1¼	80
4		326 13 8	1	100
3		245 0 0	¾	0
2		163 6 16	½	200
1		81 13 8	¼	400
78		71 9 4	⅓	428'57
28		61 5 0	⅓	533 33
28		51 0 20	⅓	640
28		40 16 16	⅓	800
28		30 12 12	⅓	1,066'66
14		20 8 8	⅓	1,600
8		10 4 4	⅓	3,200
16		5 2 2	⅓	6,400
32		2 11 1	⅓	12,800
64		1 5 12½	⅓	25,600



## COPPER ORES SOLD in CORNWALL from 1729 to 1832.

Year.	Copper Ore.		Copper.			Amount.			Produce.		Standard.	
	Tons.		Tons.	Cwt.	qr. lb.	£.	s.	d.	£.	s.	£.	s.
1729 ..	2,216	..	—		..	—			..	—	..	—
1730 ..	2,832	..	—		..	—			..	—	..	—
1731 ..	2,555	..	—		..	—			..	—	..	—
1732 ..	1,714	..	—		..	—			..	—	..	—
1733 ..	3,113	..	—		..	—			..	—	..	—
1764 ..	16,437	..	1,869	4	3 15	—			..	11 $\frac{3}{4}$	..	—
1765 ..	18,425	..	2,089	6	3 14	—			..	11 $\frac{3}{4}$	..	—
1766 ..	21,776	..	2,520	13	2 27	—			..	11 $\frac{3}{4}$	..	—
1767 ..	19,636	..	2,016	3	0 22	—			..	10 $\frac{3}{4}$	..	—
1768 ..	23,684	..	2,555	17	1 6	—			..	10 $\frac{3}{4}$	..	—
1769 ..	26,353	..	2,706	15	3 0	—			..	10 $\frac{3}{4}$	..	—
1770 ..	31,758	..	3,267	9	2 13	—			..	10 $\frac{3}{4}$	..	—
1771 ..	28,091	..	3,073	7	1 25	—			..	20 $\frac{3}{4}$	..	—
1772 ..	27,015	..	3,060	18	2 25	—			..	11 $\frac{3}{4}$	..	—
1773 ..	27,654	..	3,152	1	0 24	—			..	11	..	—

[The intervals from 1733 to 1764, and from 1773 to 1800, cannot be obtained.]

1800 ..	55,981	..	5,187	0	3 7	550,925	1	0	..	9 $\frac{1}{2}$	..	133 3 0
1801 ..	56,611	..	6,267	18	3 10	476,313	1	0	..	9 $\frac{1}{2}$	..	117 5 0
1802 ..	53,937	..	5,228	15	3 5	445,094	4	0	..	9 $\frac{3}{4}$	..	110 18 0
1803 ..	60,566	..	5,615	16	0 21	533,910	16	0	..	9 $\frac{1}{2}$	..	122 0 0
1804 ..	64,637	..	5,374	18	1 20	570,840	11	0	..	8 $\frac{3}{4}$	..	136 5 0
1805 ..	78,452	..	6,234	5	0 6	862,410	16	0	..	7 $\frac{3}{4}$	..	169 16 0
1806 ..	79,269	..	6,863	10	2 13	730,845	6	6	..	8 $\frac{3}{4}$	..	138 5 0
1807 ..	71,694	..	6,716	12	1 26	609,002	13	0	..	9 $\frac{3}{4}$	..	120 0 0
1808 ..	67,867	..	6,795	13	2 25	495,303	1	6	..	0	..	100 7 0
1809 ..	76,245	..	6,821	13	1 19	770,028	15	6	..	8 $\frac{1}{2}$	..	143 12 0
1810 ..	66,048	..	5,682	19	1 27	570,035	8	0	..	8 $\frac{1}{2}$	..	132 5 0
1811 ..	66,786	..	6,141	13	3 7	556,723	19	0	..	9 $\frac{1}{2}$	..	120 12 0
1812 ..	71,547	..	6,720	7	2 4	549,665	6	6	..	9 $\frac{3}{4}$	..	111 1 0
1813 ..	74,047	..	6,918	3	0 6	594,345	10	0	..	9 $\frac{1}{2}$	..	115 7 0
1814 ..	74,322	..	6,369	13	3 7	627,501	10	0	..	8 $\frac{1}{2}$	..	130 12 0
1815 ..	78,483	..	6,525	6	3 25	552,813	8	6	..	8 $\frac{1}{2}$	..	117 16 0
1816 ..	77,334	..	6,697	4	0 17	447,959	17	0	..	8 $\frac{3}{4}$	..	98 13 0
1817 ..	76,701	..	6,498	2	0 16	494,010	12	6	..	8 $\frac{1}{2}$	..	108 10 0
1818 ..	86,174	..	6,849	7	1 1	686,005	8	4	..	7 $\frac{3}{4}$	..	134 15 0
1819 ..	88,736	..	6,804	2	2 7	623,595	4	6	..	7 $\frac{3}{4}$	..	127 10 0
1820 ..	91,473	..	7,508	0	3 26	602,441	12	0	..	8 $\frac{1}{2}$	..	113 15 0
1821 ..	98,426	..	8,514	19	2 12	605,968	19	8	..	8 $\frac{1}{2}$	..	103 0 0
1822 ..	100,364	..	8,569	18	3 10	638,715	9	6	..	8 $\frac{3}{4}$	..	106 14 0
1823 ..	97,017	..	7,730	2	1 7	605,083	1	8	..	8	..	112 16 0
1824 ..	103,710	..	8,004	9	2 19	636,741	2	11	..	7 $\frac{1}{2}$	..	115 13 0
1825 ..	110,964	..	8,468	6	1 20	820,215	13	11	..	7 $\frac{3}{4}$	..	132 17 0
1826 ..	122,846	..	9,767	17	2 3	708,268	11	7	..	8	..	107 0 0
1827 ..	131,876	..	10,440	2	0 7	783,818	16	6	..	7 $\frac{3}{4}$	..	109 16 0
1828 ..	124,272	..	9,447	8	0 8	714,992	10	6	..	7 $\frac{3}{4}$	..	112 0 0
1829 ..	130,449	..	10,292	13	2 18	754,904	0	0	..	7 $\frac{3}{4}$	..	100 10 0
1830 ..	141,263	..	11,554	18	0 5	802,979	9	0	..	8 $\frac{3}{4}$	..	108 2 0
1831 ..	137,893	..	11,836	9	0 7	798,308	5	6	..	8 $\frac{3}{4}$	..	99 9 0
1832 ..	136,719	..	11,491	13	3 12	833,131	17	0	..	8 $\frac{3}{4}$	..	105 4 0

From this period the returns are compiled from "Gryll's Annual Mining Sheet," and are made up to the 30th of June in each year, as shown in the following Tables.

AN ACCOUNT of Sales, by Public Ticketings, of British and Foreign Copper Ores in Cornwall and Swansea, from the 30th June, 1832, to the 30th June, 1849, showing the Averages of the per-centage of produce in metal, prices, computed quantities of fine Copper, with General Averages, Total Produce in Metal, and Money Value of the whole. Also giving the Value of Ore computed to produce a Ton of Copper.

In the Years ending	CORNWALL.						SWANSEA.						CORNWALL and SWANSEA Average.					
	Computed quantity of ore in tons of 21 cwt.	Average produce per cent.	Computed quantity of fine copper.	Average price of ore per ton of 21 cwt.	Total value in money.	Computed quantity of ore in tons of 21 cwt.	Average produce per cent.	Computed quantity of fine copper.	Average price of ore per ton of 21 cwt.	Total value in money.	Total produce in fine copper.	Total value of the whole in money.	Average value of the quantity of ore to make a ton of copper.	Average value of Cornish ore to make a ton of copper.	Average value of Swansea ore to make a ton of copper.			
30th June,	Tons.		Tons.	£. s. d.	£.	Tons.		Tons.	£. s. d.	£.	Tons.	£.	£. s. d.	£. s. d.	£. s. d.			
	1833	138,300	8	6 1 6	838,709	13,101	8½	1,138	7 5 0	95,008	12,343	953,717	77 5 4	476 15 582	0 10			
	1834	143,296	7½	6 4 0	887,902	18,112	8½	1,580	7 7 6	133,821	12,805	1,021,723	79 15 979	2 084	14 0			
	1835	150,617	8½	5 18 6	893,403	28,771	9½	2,833	7 15 6	223,990	15,105	1,117,393	73 19 572	15 1079	1 3			
	1836	140,981	8½	6 17 0	957,752	34,366	11½	3,849	9 17 6	340,025	15,489	1,297,777	83 15 882	5 788	6 9			
	1837	140,753	8½	6 9 1	918,614	34,216	11½	3,960	9 18 0	338,976	14,783	1,257,590	85 1 484	17 685	12 0			
	1838	145,088	7½	5 17 6	857,780	42,931	13½	5,906	11 4 6	481,323	17,433	1,339,103	76 16 874	8 381	9 11			
	1839	159,551	7½	5 17 0	932,298	46,474	14½	7,296	12 1 6	597,996	19,747	1,536,294	77 9 1074	1 581	19 3			
	1840	147,266	7½	5 7 6	792,758	50,279	15	8,473	11 19 6	674,012	19,511	1,466,770	75 3 671	16 579	10 11			
	1841	135,090	7½	6 1 6	819,949	59,378	17½	10,290	14 14 6	871,248	20,277	1,601,997	83 8 182	2 084	13 4			
	1842	135,581	7½	6 1 6	822,871	56,821	16½	9,378	13 5 0	808,182	19,274	1,631,053	84 12 583	3 086	3 7			
	1843	144,806	7½	5 11 0	804,446	60,554	16½	9,862	13 6 0	805,213	20,788	1,609,659	77 8 873	12 781	13 0			
	1844	152,667	7½	5 6 10	815,246	65,520	16½	11,108	13 9 4	882,568	22,355	1,697,814	75 18 972	12 379	9 0			
	1845	157,000	7½	5 6 3	835,351	62,950	16½	10,349	12 1 5	759,999	22,588	1,595,350	70 12 668	5 073	8 10			
	1846	158,913	7½	5 11 7	886,785	64,987	15½	9,798	11 10 6	748,915	22,236	1,635,700	73 11 271	6 476	10 3			
	1847	148,674	8½	5 11 9	830,739	53,284	16½	8,857	12 13 9	676,069	20,823	1,506,808	72 7 369	8 676	6 7			
	1848	155,616	8½	5 6 0	825,080	50,731	17	8,645	12 8 2	629,660	21,514	1,454,741	67 12 464	2 272	16 8			
	1849	144,983	8½	4 19 0	716,917	49,135	18½	9,011	12 5 6	604,245	21,064	1,321,163	62 14 559	9 767	1 2			
Total Amt.	2,499,782		195,793		14,456,600	800,610		122,343		9,671,250	318,135	24,127,852						
Averages	147,046	7-832	11,517	5 15 8	850,388	47,095	15-261	7,107	12 1 7	568,897	18,714	1,419,285	75 16 1073	16 979	0 11			

SALES of BRITISH COPPER ORES in CORNWALL and SWANSEA, in the Six Years ending 30th June, 1849; with the Quantities and Value of Ore, the Averages in each Year, Quantities of Fine Copper in the Ore, Prices per Ton, Value in Money, &c.

	Tons of 21 cwt.	Average Produce per cent.	Fine Copper.	Average Price of Ore.	Value.	Total Value.	Quantities of Ore.	Average Produce per cent.	Fine Copper.	Average Price.	Value of Ore to a Ton of Copper.
			Tons.	£. s. d.	£.	£.	Tons.		Tons.	£. s. d.	£. s. d.
1844 { Sales in Cornwall ..	152,667	7 $\frac{3}{4}$	11,247	5 6 10	815,246	} 952,090	173,251	7 $\cdot$ 588	12,968	5 9 11	73 8 4
1844 { Sales at Swansea ..	20,584	8 $\cdot$ 363	1,721	6 13 0	136,844						
1845 { Sales in Cornwall ..	157,000	7 $\frac{3}{4}$	12,239	5 6 3	835,351	} 951,355	176,026	7 $\cdot$ 883	13,818	5 8 1	68 17 0
1845 { Sales at Swansea ..	19,026	8 $\cdot$ 301	1,579	6 1 11	116,004						
1846 { Sales in Cornwall ..	158,913	7 $\frac{1}{2}$	12,448	5 11 7	886,795	} 1,002,329	177,142	7 $\cdot$ 922	13,958	5 13 2	71 16 2
1846 { Sales at Swansea ..	18,229	8 $\cdot$ 282	1,510	6 6 9	115,544						
1847 { Sales in Cornwall ..	148,674	8 $\frac{1}{2}$	11,966	5 11 9	830,739	} 921,879	163,571	8 $\cdot$ 134	13,160	5 12 9	70 1 0
1847 { Sales at Swansea ..	14,897	8 $\cdot$ 015	1,194	6 2 4	91,140						
1848 { Sales in Cornwall ..	155,616	8 $\frac{1}{2}$	12,870	5 6 0	825,080	} 921,019	170,238	8 $\cdot$ 438	14,364	5 8 2	64 2 5
1848 { Sales at Swansea ..	14,622	10 $\cdot$ 215	1,494	6 11 3	95,939						
1849 { Sales in Cornwall ..	144,983	8 $\frac{5}{8}$	12,053	4 19 0	716,917	} 783,036	155,865	8 $\cdot$ 438	13,043	5 0 6	60 0 8
1849 { Sales at Swansea ..	10,322	9 $\cdot$ 094	990	6 1 6	66,119						
Total Quantities ..	1,016,093		81,311			5,531,708	1,016,093		81,311		
Aver. Amounts, &c.						921,951	169,349	8 $\cdot$ 002	13,552	5 8 11	68 0 7

SALES of FOREIGN COPPER ORES at SWANSEA, in the Six Years ending 30th June, 1849; with the Quantities and Value of Ore, the Averages in each Year, Quantities of Fine Copper in the Ore, Prices per Ton, Value in Money, &c.

	Tons of 21 cwt.	Average Produce per cent.	Fine Copper.	Average Price of Ore.	Value.	Total Value.	Quantities of Ore.	Average Produce per cent.	Fine Copper.	Average Price.	Value of Ore to a Ton of Copper.
			Tons.	£. s. d.	£.	£.	Tons.		Tons.	£. s. d.	£. s. d.
1844 {	Total sales at Swansea..	65,520	16½	13 9 4	882,568	} 745,724	44,936	20·872	9,387	16 11 11	79 8 11
	Less British ores .. ..	20,584	8·303	6 13 0	136,844						
1845 {	Total sales at Swansea..	62,950	16½	12 1 5	759,999	} 643,995	43,924	19·967	8,770	14 13 3	73 8 8
	Less British ores .. ..	19,026	8·301	6 1 11	116,004						
1846 {	Total sales at Swansea..	64,987	15½	11 10 6	748,915	} 633,371	46,758	17·703	8,278	13 10 11	76 10 3
	Less British ores .. ..	18,229	8·282	6 6 9	115,544						
1847 {	Total sales at Swansea..	53,284	16½	12 13 9	676,069	} 584,929	38,387	19·834	7,663	15 4 9	76 6 8
	Less British ores .. ..	14,897	8·015	6 2 4	91,140						
1848 {	Total sales at Swansea..	50,731	17	12 8 2	629,660	} 533,721	36,109	19·804	7,151	14 15 7	74 12 9
	Less British ores .. ..	14,622	10·215	6 11 3	95,939						
1849 {	Total sales at Swansea ..	49,135	18½	12 5 6	604,246	} 538,127	38,253	21·057	8,021	14 1 4	67 1 10
	Less British ores .. ..	10,882	9·094	6 1 6	66,119						
	Total Quantities .. ..					3,679,867	248,367		49,270		
	Average Amounts, &c...					613,311	41,394	19·838	8,212	14 16 4	74 13 8



QUANTITIES of COPPER contained in Ores purchased by Smelters in Six Years ending 30th June, 1849; distinguishing British and Foreign produce, Quantities purchased at Ticketings, imported by Smelters, or bought by Private Contract, aggregate Value, &c.

	Copper produced from British Ores.			Copper produced from Foreign Ores.			Total Purchases.	From British Ores.		From Foreign Ores.	Total Value.
	Purchased at Ticketings in Cornwall & Swansea.	Purchased by Private Contract.	Total British Ores.	Purchased at Ticketings at Swansea.	Imported and bought by Private Contract.	Total Foreign Ores.		Total Value of British Ores, computed at Average Prices.	Total Value of Foreign Ores, at Average Prices.		
	Copper Tons.	Copper Tons.	Copper Tons.	Copper Tons.	Copper Tons.	Copper Tons.	Copper Tons.	£.	£.	£.	
1844	12,968	1,873	14,841	9,387	3,287	12,674	27,515	1,089,503	1,006,851		2,096,454
1845	13,818	1,121	14,939	8,770	2,106	10,876	25,815	1,028,535	798,528		1,827,063
1846	13,958	997	14,955	8,278	2,814	11,092	26,047	1,073,924	848,677		1,922,601
1847	13,160	625	13,785	7,663	1,377	9,040	22,825	965,661	690,038		1,655,699
1848	14,364	* 356	14,720	7,151	* 1,312	8,463	23,183	943,846	631,643		1,575,489
1849	13,043	* 500	13,543	8,021	* 1,000	9,021	22,563	813,031	605,219		1,418,250
Total Amounts..	81,311	5,472	86,783	49,270	11,896	61,166	147,948	5,914,600	4,580,956		10,495,556
Average per Ann.	13,552	912	14,464	8,211	1,983	10,194	24,658	985,767	763,493		1,749,259

NOTE.—The four quantities in 1848 and 1849, marked with an asterisk, are not given as correct. The previous figures in the table may be relied upon. Those standing against 1849, being even sums, will be understood to be matter of computation. It is certain, however, that considerable parcels, especially of foreign ores, were purchased by private contract, or imported; and the quantities here given may be regarded as quite below the amounts so purchased.

Quantities of COPPER ORE imported from CHILI, which paid Duty, in the Five Years 1843 to 1847 inclusive.

Year.	Copper Ore which paid Duty.	Metallic Copper charged with Duty.	Average per cent. of Metal in the Ore.	Amount of Duty received.	Rate of Duty computed at per Ton of Ore.	Rate of Duty computed at per Ton of Metal.	Mean Price of Cake Copper.	Rate per cent. of Duty on value of Copper.
1843	Tons. 19,364	Tons. 5,590	28.86	£. 34,308	£. s. d. 1 15 5	£. s. d. 6 2 8	£. s. d. 83 5 0	7.367
1844	19,302	5,646	29.25	34,749	1 16 0	6 3 1	85 5 0	7.219
1845	10,824	3,624	33.48	22,562	2 1 8	6 4 6	88 10 0	7.034
1846	12,982	4,221	32.51	25,983	2 0 0	6 3 1	90 15 0	6.781
1847	8,665	3,079	33.53	19,260	2 4 6	6 5 1	96 10 0	6.480
Totals....	71,137	22,160	31.15	136,862	1 18 6	6 3 6	88 17 0	6.950

Quantities of COPPER ORE imported from CUBA, which paid Duty, in the Five Years 1843 to 1847 inclusive.

Year.	Copper Ore which paid Duty.	Metallic Copper charged with Duty.	Average per cent. of Metal in the Ore.	Amount of Duty received.	Rate of Duty computed at per Ton of Ore.	Rate of Duty computed at per Ton of Metal.	Mean Price of Cake Copper.	Rate per cent. of Duty on value of Copper.
1843	Tons. 31,355	Tons. 5,279	16.84	£. 26,226	£. s. d. 0 16 9	£. s. d. 4 19 4	£. s. d. 83 5 0	5.966
1844	34,970	6,605	18.88	35,054	1 0 1	5 6 2	85 5 0	6.227
1845	41,171	6,602	16.04	31,747	0 15 5	4 16 2	88 10 0	5.433
1846	31,937	4,935	15.45	22,963	0 14 5	4 13 0	90 15 0	5.124
1847	23,897	3,843	16.08	17,816	0 14 10	4 12 9	96 10 0	4.806
Totals....	163,330	27,264	16.69	133,806	0 16 5	4 18 2	88 17 0	5.243

**Quantities of COPPER ORE imported from AUSTRALIA and other BRITISH POSSESSIONS,  
in the Five Years 1843 to 1847 inclusive.**

Years.	Copper Ore which paid Duty.	Metallic Copper charged with Duty.	Average per cent. of Metal in the Ore.	Amount of Duty received.	Rate of Duty computed at per Ton of Ore.	Rate of Duty computed at per Ton of Metal.	Mean Price of Cake Copper.	Rate per cent. of Duty on value of Copper.
1843	Tons. 13	Tons. Not assayed.	..	£. 14	£. s. d. ..	£. s. d. ..	£. s. d. 83 5 0	Not assayed.
1844	157	15	9'55	15	0 1 11	1 1 0	85 5 0	1'232
1845	969	187	19'30	198	0 4 1	1 1 0	88 10 0	1'186
1846	3,753	819	21'82	860	0 4 7	1 1 0	90 15 0	1'157
1847	6,722	1,026	24'19	1,725	0 5 2	1 1 0	96 10 0	1'088
Totals....	11,601	2,647	22'82	2,798	0 4 10	1 1 0	88 17 0	1'182

**Quantities of FOREIGN COPPER ORE which paid Duty in the UNITED KINGDOM, in the Five Years  
1843 to 1847 inclusive.**

Year.	Copper Ore which paid Duty.	Metallic Copper charged with Duty.	Average per cent. of Metal in the Ore.	Amount of Duty received.	Rate of Duty computed at per Ton of Ore.	Rate of Duty computed at per Ton of Metal.	Mean Price of Cake Copper.	Rate per cent. of Duty on value of Copper.
1843	Tons. 54,370	Tons. 11,654	21'43	£. 64,445	£. s. d. 1 3 8½	£. s. d. 5 10 7	£. s. d. 83 5 0	6'641
1844	58,591	13,190	22'51	75,201	1 5 8	5 14 0	85 5 0	6'685
1845	56,119	11,172	19'90	58,646	1 0 10½	5 5 0	88 10 0	5'932
1846	50,944	10,661	20'92	54,056	1 0 2½	5 1 5	90 15 0	5'387
1847	40,491	9,033	22'31	40,964	1 0 3	4 10 8	96 10 0	4'697
Totals....	260,515	55,710	21'38	293,312	1 2 6	5 5 4	88 17 0	5'927

**NOTE.**—The amount for 1848 has been presented to Parliament monthly; a statement which, with the Annual Returns, is introduced in another place. Since the passing of the Act of 1848, admitting the Foreign Ores to a nominal duty without regard to produce, the details furnished in the Tables annexed to this have not been continued.

IMPORTS of FOREIGN COPPER and COPPER ORE into the  
United Kingdom, from 1832 to 1849, inclusive.

## FRANCE.

Year end. Jan. 5.	Copper unwrought	Part wrought.	Plates and coin.	Old, for remanu- facture.	Ore.	COPPER MANUFACTURES.	
						Weight.	Value.
	T. ct.q.lb.	T. ct.q.lb.	T. ct.q.lb.	T. ct.q.lb.	T. ct.q.lb.	T. ct.q.lb.	£. s. d.
1832	—	—	0 0 0 2	0 8 0 25	—	—	2,258 0 6
1833	—	—	0 2 1 22	—	—	—	2,883 18 6
1834	—	—	0 0 0 10	—	—	—	2,345 2 10
1835	0 0 0 2	—	—	—	—	0 6 3 4	1,555 0 6
1836	—	—	0 2 0 11	—	—	1 13 2 2	2,287 16 0
1837	—	—	—	—	—	—	5,914 16 4
1838	—	—	0 1 1 2	—	—	—	1,601 13 0
1839	—	0 0 2 15	0 0 1 20	—	—	0 0 0 6	2,543 19 0
1840	—	0 1 2 4	0 0 3 14	2 7 2 2	—	—	1,897 14 0
1841	0 1 0 0	0 0 1 21	0 0 0 15	—	0 2 0 0	—	1,780 3 6
1842	0 10 0 0	0 1 1 23	0 0 0 4	—	0 1 1 25	—	1,451 0 6
1843	—	—	0 0 1 14	—	9 2 1 14	—	1,936 6 6
1844	21 13 1 15	—	0 0 0 5	0 13 3 12	0 0 0 12	—	2,788 4 10
1845	—	—	0 0 0 14	1 12 3 14	0 2 1 19	1 15 0 10	2,348 18 11
1846	—	—	0 0 2 14	—	3 15 0 0	—	2,394 19 2
1847	—	—	—	1 2 1 5	118 4 0 0	—	3,059 2 7
1848	—	—	0 0 2 3	0 9 2 20	32 4 0 12	0 1 1 4	2,841 10 0
1849	94 14 0 23	9 7 1 4	—	0 18 1 4	45 6 0 0	—	2,704 18 0

## GERMANY.

1834	0 9 3 15	0 2 3 19	0 13 3 14	0 10 2 12	—	—	1,518 4 0
1835	—	0 1 3 11	—	1 8 2 10	—	0 4 3 8	2,161 10 4
1836	0 0 0 21	0 3 2 3	0 0 0 1	3 9 3 5	—	5 19 1 20	2,903 19 6
1837	—	2 11 3 8	—	7 4 3 19	8 8 2 25	28 2 2 0	2,061 5 2
1838	—	0 3 0 7	—	0 2 2 14	2 0 19	12 6 0 22	1,211 13 4
1839	—	0 15 2 8	0 0 0 22	0 5 3 17	125 18 0 27	1 4 2 19	1,366 8 2
1840	—	0 5 2 14	—	2 1 2 6	—	3 15 0 0	313 12 0
1841	—	—	0 0 1 25	0 19 0 20	—	10 17 1 7	327 2 6
1842	—	—	0 0 0 7	0 3 3 21	33 0 0 0	28 18 0 21	249 11 0
1843	—	0 0 2 23	—	—	—	12 14 3 20	557 7 6
1844	—	0 1 3 7	0 0 3 12	1 10 0 0	—	5 3 0 2	101 6 6
1845	—	0 6 2 23	1 14 3 8	4 12 3 8	—	6 6 1 16	204 0 0
1846	—	—	3 13 0 10	1 11 0 24	0 1 0 0	10 15 1 17	295 0 0
1847	—	1 0 0 18	0 17 2 7	—	—	11 14 2 21	402 4 0
1848	0 1 9 0	0 1 0 9	0 18 2 18	5 18 2 25	—	24 0 2 24	520 0 6
1849	—	2 0 0 0	3 6 1 20	4 14 3 6	—	—	1,152 5 11

## ITALY.

1832	—	—	0 0 0 2	—	—	—	7 0 0
1833	—	—	0 0 1 23	—	—	—	2 5 0
1834	—	—	—	—	—	—	6 5 0
1835	—	—	0 0 0 20	—	2 7 1 20	—	9 5 0
1836	—	—	—	0 2 3 14	—	1 2 0 6	1 5 0
1837	13 13 1 19	—	—	—	—	0 17 0 22	24 5 0
1838	41 1 0 23	—	—	—	16 11 2 2	0 4 1 9	13 0 0
1839	—	—	—	—	—	—	3 0 0
1840	4 15 3 20	—	0 0 1 7	—	30 19 0 12	—	13 18 0
1841	0 5 2 11	—	0 0 3 20	—	102 13 1 14	—	1 19 0
1842	—	—	0 0 2 16	—	245 10 0 24	—	28 3 0
1843	—	—	0 0 0 2	—	324 9 1 4	—	—
1844	0 0 2 14	—	0 0 1 0	—	365 17 3 24	2 14 0 17	159 0 0
1845	0 8 1 26	—	—	0 3 1 24	558 10 3 8	0 14 2 3	10 10 0
1846	—	—	0 0 1 5	—	640 11 2 14	1 19 0 1	58 12 6
1847	—	—	0 0 1 23	0 11 2 8	576 16 2 2	1 6 3 6	37 0 0
1848	—	—	—	2 11 3 16	207 2 3 3	0 10 1 13	130 0 0
1849	9 0 0 0	—	—	1 12 1 13	123 3 3 6	—	63 5 0



## RUSSIA.

Year end. Jan. 5.	Copper unwrought	Part wrought.	Plates and coin.	Old, for remanu- facture.	Ore.	COPPER MANUFACTURES.	
						Weight.	Value.
	T. ct.q.lb.	T. ct.q.lb.	T. ct.q.lb.	T. ct.q.lb.	T. ct.q.lb.	T. ct.q.lb.	£. s. d.
1832	—	—	—	0 0 3 12	—	—	—
1833	—	—	—	—	—	—	—
1834	5 1 2 9	0 0 0 0	—	0 5 0 0	0 0 0 18	—	—
1835	5 1 0 23	26 19 1 18	—	—	—	—	7 10 0
1836	9 1 2 4	16 1 1 14	—	—	—	—	41 15 0
1837	0 0 3 22	—	—	—	0 3 1 11	—	4 0 0
1838	—	—	—	0 0 3 20	—	—	5 0 0
1839	—	—	—	1 1 3 5	—	—	—
1840	—	—	—	0 8 0 23	—	—	—
1841	—	—	—	—	—	—	3 0 0
1842	—	—	—	—	—	—	22 0 0
1843	—	—	—	0 0 2 24	—	—	46 15 6
1844	3 4 1 8	—	0 0 0 1	1 8 0 7	—	0 17 0 16	2 17 0
1845	—	—	—	—	—	—	96 15 0
1846	—	—	1 5 2 14	—	—	1 12 2 16	62 10 0
1847	32 2 3 2	—	—	0 12 3 4	—	—	3 0 0
1848	—	—	—	0 1 0 0	—	—	14 15 0
1849	—	—	3 0 0 0	0 11 1 24	—	—	8 10 0

## HOLLAND.

1834	—	—	0 2 0 25	—	—	—	8 0 0
1835	—	—	—	0 2 0 1	43 18 0 20	4 5 2 25	1 10 0
1836	0 0 0 7	—	0 0 0 4	—	23 3 2 23	—	59 0 0
1837	0 17 3 16	0 1 3 12	—	0 0 3 21	57 8 0 0	9 2 0 16	72 1 6
1838	—	—	—	—	35 16 0 0	10 18 0 13	24 19 6
1839	—	—	0 0 0 7	—	38 0 0 0	—	59 5 0
1840	1 14 2 7	0 0 1 12	—	0 0 3 0	50 0 0 0	—	100 0 0
1841	—	—	—	—	40 6 0 0	0 1 0 20	65 3 0
1842	—	—	0 0 0 14	—	90 1 0 0	3 0 3 18	512 3 0
1843	—	—	—	—	13 5 2 0	23 17 2 5	288 6 0
1844	—	0 0 1 6	—	—	63 18 2 14	33 2 3 6	114 10 0
1845	—	0 1 2 23	0 0 2 0	—	89 16 3 25	15 8 0 15	296 5 0
1846	—	0 1 0 22	—	—	110 5 3 11	27 9 3 3	670 15 0
1847	—	—	—	0 13 2 9	2 12 3 3	32 12 0 10	1,033 17 0
1848	—	0 1 0 18	—	—	76 10 0 0	14 10 0 3	221 1 0
1849	—	—	—	19 8 0 16	10 10 1 9	—	3,948 12 6

## NORWAY.

1835	—	—	—	0 2 1 5	116 5 2 10	—	—
1836	—	—	—	—	507 11 0 13	—	—
1837	—	—	—	—	182 17 1 16	—	—
1838	—	—	—	—	—	—	—
1839	—	—	—	—	—	—	—
1840	—	—	—	0 4 2 17	—	—	—
1841	—	—	73 17 0 11	—	57 8 2 14	—	—
1842	—	—	—	1 18 1 25	—	—	—
1843	79 9 1 10	—	50 10 0 5	—	39 6 1 0	—	—
1844	—	45 14 3 22	23 12 1 2	—	5 10 1 20	—	—
1845	140 5 3 6	—	—	—	3 18 1 9	—	—
1846	69 9 2 13	—	—	—	4 7 2 21	—	—
1847	—	69 19 0 4	—	—	—	—	—
1848	32 17 3 27	—	—	0 0 2 19	0 0 1 0	—	334 10 0
1849	—	62 12 3 11	—	—	—	—	—

## SWEDEN.

Year end Jan. 5.	Copper unwrought	Part wrought.	Plates and coin.	Old, for remanu- facture.	Ore.	COPPER MANUFACTURES.	
						Weight.	Value.
	T. ct. q.lb.	T. ct. q.lb.	T. ct. q.lb.	T. ct. q.lb.	T. ct. q.lb.	T. ct. q.lb.	£. s. d.
1832	—	—	—	—	714 14 0 0	—	—
1833	—	0 0 1 17	—	—	366 6 0 32	—	10 0 0
1834	—	—	—	—	789 18 2 9	—	—
1835	—	—	—	—	635 0 3 10	—	—
1836	—	—	—	—	493 9 0 26	—	—
1837	11 14 2 11	—	—	—	1,905 8 3 18	—	—
1838	—	—	—	1 16 2 3	1,469 10 0 0	—	—
1839	45 7 3 21	—	—	—	718 15 2 11	—	—
1840	277 11 2 8	—	—	—	501 18 0 0	—	2 0 0
1841	191 18 1 14	—	—	—	23 10 0 0	—	—
1842	126 6 0 3	—	—	—	16 12 0 14	—	5 0 0
1843	55 11 2 21	—	—	0 6 1 8	—	—	—
1844	—	—	—	—	—	—	0 5 0
1845	—	—	—	—	—	—	—
1846	—	2 0 0 15	—	—	—	—	—
1847	—	—	—	—	—	—	—
1848	—	—	—	0 7 3 24	—	—	—
1849	2 0 0 6	1 19 3 27	—	—	—	—	—

## SUMMARY.

Imports of Copper and Copper Ore from the whole of Europe into the United Kingdom from 1832 to 5th January, 1849.

Copper un- wrought, in bricks or pigs, rose copper, and cast copper.	Part wrought bars, rods, or ingots, hammered or raised.	Plates and coin.	Old, for remanu- facture.	Ore.	COPPER MANUFACTURES.	
					Entered by Weight.	Entered by Value.
T. ct. q. lb.	T. ct. q. lb.	T. ct. q. lb.	T. ct. q. lb.	T. ct. q. lb.	T. ct. q. lb.	£. s. d.
*23 16 0 25	0 1 3 11	0 0 1 11	1 14 0 5	714 14 0 4	—	2,920 13 4
8 11 0 26	0 4 1 0	0 3 1 0	5 11 2 24	400 4 2 16	—	4,589 16 10
11 8 0 6	0 2 3 19	0 16 0 22	2 6 3 23	880 18 2 6	—	3,878 11 10
27 0 1 16	28 6 0 1	0 0 0 22	2 1 3 7	851 10 3 24	4 17 1 9	3,739 14 10
17 15 0 23	16 4 3 17	0 2 0 16	5 10 1 13	1,065 9 1 21	31 18 2 23	5,326 2 0
334 17 2 18	4 15 1 7	0 0 0 1	7 5 3 12	2,173 16 2 25	38 1 3 0	8,081 0 0
177 2 3 14	0 3 0 7	0 1 1 4	3 12 3 9	1,522 0 2 1	23 8 2 16	2,889 11 4
55 7 3 21	0 16 0 23	0 0 3 13	1 12 1 13	882 13 3 21	1 8 2 3	4,002 17 2
287 6 0 13	0 7 2 2	0 1 0 21	7 15 1 12	582 17 2 21	3 15 0 0	2,336 3 6
162 4 3 25	0 0 1 21	74 0 1 26	2 8 2 3	226 11 1 3	10 18 1 27	2,190 18 0
126 16 0 3	0 1 1 23	0 0 3 18	4 2 0 20	385 4 3 7	31 19 0 11	2,274 17 6
141 8 3 2	0 0 2 33	50 10 2 12	0 16 3 11	394 18 3 8	36 12 1 25	2,838 0 0
28 15 0 5	86 6 1 0	54 5 1 20	4 15 0 22	672 18 3 0	41 17 0 13	3,217 1 4
140 14 1 4	0 8 1 18	1 15 2 4	6 10 3 11	674 5 1 20	35 18 3 1	2,990 18 11
69 10 0 3	2 1 3 20	5 0 2 27	1 11 1 15	860 18 2 26	49 11 0 15	3,634 17 8
44 9 0 1	70 19 0 22	0 18 0 2	3 11 0 8	715 17 2 16	49 2 1 2	4,689 9 7
194 0 0 17	70 7 0 6	59 18 0 13	6 10 0 12	316 6 2 5	42 15 1 0	4,222 11 6
105 14 1 1	76 1 2 14	7 0 1 0	28 11 0 14	302 3 1 23	—	8,076 11 5

\* In this table the returns are also made up for the years 1832-48.

QUARTERLY SALES of COPPER ORES in CORNWALL for  
the Six Years ending 31st December, 1849.

				Tons.	£.	s.	d.
Quarter ending	March 31,	1844	..	..	39,874	219,019	3 0
"	June 30,	"	..	..	37,306	188,721	8 0
"	Sept. 30,	"	..	..	38,073	195,626	17 6
"	Dec. 31,	"	..	..	37,716	198,066	16 0
Total				..	Tons 152,969	£801,434	4 6
Quarter ending	March 31,	1845	..	..	40,367	215,284	3 0
"	June 30,	"	..	..	40,844	226,373	3 0
"	Sept. 30,	"	..	..	42,420	250,257	1 6
"	Dec. 31,	"	..	..	38,926	228,019	18 6
Total				..	Tons 162,557	£919,934	6 0
Quarter ending	March 31,	1846	..	..	39,335	207,697	10 0
"	June 30,	"	..	..	32,232	200,810	11 6
"	Sept. 30,	"	..	..	37,784	196,486	16 0
"	Dec. 31,	"	..	..	35,079	191,197	9 0
Total				..	Tons 144,430	£796,192	6 6
Quarter ending	March 31,	1847	..	..	38,071	222,542	9 0
"	June 30,	"	..	..	34,875	204,662	4 6
"	Sept. 30,	"	..	..	40,174	229,969	2 6
"	Dec. 31,	"	..	..	40,000	216,262	14 0
Total				..	Tons 153,120	£873,436	10 0
Quarter ending	March 31,	1848	..	..	37,537	202,517	9 0
"	June 30,	"	..	..	37,905	176,330	17 0
"	Sept. 30,	"	..	..	36,287	164,409	10 6
"	Dec. 31,	"	..	..	35,972	176,833	0 6
Total				..	Tons 147,701	£720,090	17 0
Quarter ending	March 31,	1849	..	..	36,093	188,507	0 6
"	June 30,	"	..	..	36,631	187,167	15 6
"	Sept. 30,	"	..	..	37,103	194,495	11 6
"	Dec. 31,	"	..	..	36,508	193,444	11 6
Total				..	Tons 146,335	£763,614	19 0

QUARTERLY SALES of COPPER ORES in CORNWALL,  
for the Year 1849.

Quarter ending	Ore, in Tons of 21 Cwts.	Fine Copper.	Amount of Money.	Averg. per cent.	Average Standard.	Per Ton.
			£. s. d.		£. s. d.	£. s. d.
March 31 ..	36,093	2,981 11	188,507 0 6	8½	98 12 0	5 4 5
June 30 ..	36,631	2,906 14	187,167 15 6	7¾	98 16 2	5 2 2
September 30 ..	37,103	2,992 17	194,495 11 6	8½	97 14 1	5 4 10
December 31 ..	36,508	2,810 2	193,444 11 6	7¾	104 10 11	5 5 7
	146,335	11,691 4	763,614 19 0	8	99 18 3	5 4 3

# ACCOUNT of SALES of COPPER ORES in CORNWALL, 1849.

## FIRST QUARTER.

Date of Sale.	Average Standard.	Av. Produce.	Price.	Quantity of Ore.	Computed Quantity of Fine Copper.	Amount of Sales.	Value of Ore to produce 1 Ton of Copper.
	£. s. d.		£. s. d.	21 cwt.	Tons. cwt.	£. s. d.	£. s. d.
January 11	87 7 0	8 $\frac{3}{4}$	4 12 6	1,813	152 18	8,376 13 0	54 15 8
„ 18	84 12 0	9 $\frac{1}{4}$	5 9 0	2,633	255 3	14,346 18 6	56 4 7
„ 25	93 10 0	7 $\frac{1}{2}$	4 13 0	3,841	304 0	17,874 10 0	58 16 0
February 1	95 16 0	7 $\frac{1}{2}$	4 6 0	3,983	293 0	17,166 12 0	58 11 9
„ 8	91 16 0	9	5 10 0	2,145	192 19	11,819 1 0	61 5 1
„ 22	90 8 0	9 $\frac{1}{4}$	5 18 6	2,990	287 0	17,723 1 0	61 15 1
March 1	104 0 0	7	4 10 6	2,564	178 14	11,535 16 6	64 11 1
„ 8	105 18 0	8	5 14 6	3,684	278 6	19,832 16 6	71 5 3
„ 15	104 12 0	8 $\frac{1}{2}$	6 5 6	2,677	231 2	16,818 1 0	72 15 6
„ 22	99 7 0	9 $\frac{1}{2}$	6 13 0	2,885	272 7	19,122 0 0	70 4 3
„ 29	107 5 0	7 $\frac{1}{2}$	5 6 0	3,665	276 10	19,598 6 6	70 17 7
Totals ....	98 12 0	8 $\frac{1}{4}$	5 4 5	36,093	2,981 11	188,507 0 5	63 4 6

## SECOND QUARTER.

April 5	106 13 0	7 $\frac{1}{2}$	5 6 0	3,942	298 8	20,997 8 6	70 7 4
„ 12	104 14 0	8 $\frac{1}{4}$	5 18 0	2,547	210 12	15,048 10 0	71 9 1
„ 19	99 17 0	9 $\frac{1}{4}$	6 16 6	2,741	262 15	18,699 8 6	71 3 4
„ 26	112 3 0	6 $\frac{1}{2}$	4 13 6	2,671	176 5	12,423 5 6	70 9 9
May 3	105 8 0	7 $\frac{1}{2}$	5 6 6	3,791	290 11	20,206 0 0	69 10 11
„ 10	100 9 0	8 $\frac{1}{4}$	5 8 6	2,584	210 19	14,092 6 6	66 16 1
„ 17	93 18 0	9 $\frac{1}{4}$	6 7 6	2,393	232 15	15,273 11 0	65 12 7
„ 24	98 5 0	7 $\frac{1}{2}$	4 5 0	3,961	281 7	16,735 18 6	59 9 8
„ 31	93 1 0	7 $\frac{1}{2}$	4 9 0	3,948	305 18	17,612 1 0	57 11 2
June 7	90 14 0	8	4 11 0	2,496	201 7	11,407 19 6	56 13 2
„ 21	86 16 0	9	5 2 0	2,929	264 18	14,916 18 0	56 8 6
„ 28	99 3 0	6 $\frac{1}{2}$	3 14 0	2,628	170 19	9,724 8 6	56 17 8
Totals ....	98 16 2	7 $\frac{1}{2}$ 935	5 2 2	36,631	2,906 14	187,167 15 6	64 7 10

## THIRD QUARTER.

July 5	96 17 0	7 $\frac{1}{2}$	4 13 0	3,598	274 6	16,679 0 6	60 16 1
„ 12	94 9 0	8 $\frac{1}{2}$	5 10 6	2,538	221 2	13,913 5 0	62 18 6
„ 19	91 11 0	10	6 9 0	2,115	212 14	13,662 17 0	64 4 8
„ 26	100 0 0	7 $\frac{1}{2}$	4 10 6	3,623	264 6	16,473 4 6	62 6 7
August 2	98 14 0	7 $\frac{1}{2}$	4 8 0	3,881	280 15	17,037 2 6	60 13 8
„ 9	95 19 0	8 $\frac{1}{2}$	5 10 6	2,595	224 2	14,363 0 6	64 1 10
„ 23	94 1 0	9 $\frac{1}{4}$	6 2 6	3,041	296 19	18,624 9 6	62 14 5
„ 30	108 2 0	6 $\frac{1}{2}$	3 18 0	2,977	183 0	11,599 15 6	63 2 3
Septemb. 6	103 3 0	7 $\frac{1}{2}$	5 8 0	3,801	300 10	20,549 12 6	68 7 8
„ 13	103 16 0	8 $\frac{1}{2}$	5 16 6	2,677	220 16	15,563 15 6	70 9 9
„ 20	99 17 0	9 $\frac{1}{2}$	6 14 0	2,467	233 0	16,475 3 0	70 14 2
„ 27	106 10 0	7 $\frac{1}{2}$	5 2 6	3,790	281 7	19,554 5 6	69 10 0
Totals ....	97 14 1	8 $\frac{1}{2}$ 066	5 4 10	37,103	2,992 17	194,495 11 6	64 19 9

## FOURTH QUARTER.

October 4	106 7 0	7 $\frac{1}{2}$	4 16 0	3,998	283 6	19,126 13 0	67 10 3
„ 11	102 7 0	8 $\frac{1}{2}$	6 1 0	1,926	164 19	11,587 15 6	70 5 0
„ 18	98 1 0	9 $\frac{1}{4}$	6 10 6	2,594	245 9	16,938 10 6	69 0 2
„ 25	110 8 0	6 $\frac{1}{2}$	4 0 6	2,713	166 7	10,906 6 0	65 11 3
Novem. 1	104 8 0	7 $\frac{1}{2}$	4 18 6	3,965	291 6	19,516 2 6	66 19 11
„ 8	102 1 0	8 $\frac{1}{2}$	5 11 0	2,577	209 5	14,267 8 6	68 3 8
„ 22	97 16 0	9 $\frac{1}{4}$	6 11 0	2,358	224 13	15,494 6 6	68 19 5
„ 29	108 0 0	7	4 16 0	4,220	293 16	20,121 16 0	68 9 9
Decem. 6	108 15 0	7 $\frac{1}{2}$	5 2 6	4,364	317 8	22,522 2 0	70 19 6
„ 13	104 18 0	8	5 12 0	2,887	229 8	16,124 19 0	70 5 10
„ 20	100 18 0	9	6 7 0	2,527	228 1	16,059 16 0	70 8 5
„ 27	110 17 0	6 $\frac{1}{2}$	4 10 6	2,379	156 4	10,773 16 0	68 19 6
Totals ....	104 10 11	7 $\frac{1}{2}$ 696	5 5 7	36,508	2,810 2	193,444 11 6	68 16 9



PURCHASERS of COPPER ORES at TICKETINGS, in CORNWALL, in the Year 1849.

Names of Companies.	First Quarter.		Second Quarter.		Third Quarter.		Fourth Quarter.		Total.	
	Tons.	Amount.	Tons.	Amount.	Tons.	Amount.	Tons.	Amount.	Tons.	Amount.
		£. s. d.		£. s. d.		£. s. d.		£. s. d.		£. s. d.
Williams & Co...	8,619	50,559 6 11	9,660	53,201 17 9	7,558	46,272 4 0	9,289	54,714 7 9	35,126	204,747 19 5
Vivian & Sons ..	7,436	39,893 6 8	7,732	40,287 12 3	8,754	45,480 16 6	7,364	40,726 0 10	31,286	166,387 16 3
Grenfell & Sons..	6,120	30,332 0 6	5,644	27,405 5 5	4,934	25,316 1 6	5,071	24,212 12 7	21,769	113,266 0 0
Sims & Co... ..	5,429	25,058 4 5	5,512	26,380 7 1	5,318	25,826 5 9	5,108	24,635 11 0	21,367	101,900 8 3
Freeman & Co... ..	4,580	22,861 15 6	4,661	23,933 11 11	4,582	22,563 4 11	4,829	23,501 13 10	18,652	92,860 6 2
Mines Royal ..	2,473	13,977 9 8	1,971	8,469 13 1	2,851	13,929 0 6	2,444	13,162 2 4	9,739	49,478 5 7
Schneider & Co...	990	5,038 6 6	1,210	6,108 9 11	2,843	13,569 2 4	2,087	10,278 10 11	7,130	34,994 9 8
Crown Copper ..	176	686 10 3	241	1,440 18 1	263	153 16 0	316	2,213 0 1	996	4,494 4 5
Total .. ..	36,993	188,507 0 6	36,631	187,167 15 6	37,103	194,495 11 6	36,508	193,444 11 6	146,335	763,614 19 0

## PURCHASERS of COPPER ORES at TICKETINGS, in SWANSEA, in the Year 1849.

Names of Companies.	First Quarter.		Second Quarter.		Third Quarter.		Fourth Quarter.		Total.	
	Tons.	Amount.	Tons.	Amount.	Tons.	Amount.	Tons.	Amount.	Tons.	Amount.
	£	s. d.	£	s. d.	£	s. d.	£	s. d.	£	s. d.
Williams & Co. ..	2,174	27,061 4 0	3,633	52,039 9 9	2,563	26,721 18 5	2,643	35,910 17 6	11,813	141,733 9 8
Vivian & Sons ..	2,030	23,976 19 4	3,972	51,492 13 6	1,794	15,682 17 0	2,170	26,675 6 6	9,966	117,827 16 6
Grenfell & Sons ..	1,136	11,599 12 0	2,286	28,371 13 6	1,873	18,012 6 0	1,252	15,919 12 6	6,547	73,913 4 0
Sims & Co. ..	1,093	13,527 5 0	1,633	23,855 14 5	1,055	16,749 6 0	1,233	20,004 10 0	5,014	74,136 15 5
Freeman & Co. ..	215	2,876 9 6	746	10,459 2 11	604	4,882 15 0	625	5,175 15 6	2,190	49,285 19 5
Schneider & Co. ..	642	9,980 2 0	859	15,277 11 2	580	10,042 17 0	524	9,072 15 9	2,603	44,373 5 11
English Copper ..	473	6,473 0 10	847	10,484 10 0	758	7,770 14 11	684	9,555 15 3	2,762	33,784 1 0
Crown Copper..	176	686 10 3	241	1,440 18 1	..	.. ..	136	1,224 6 6	653	3,351 14 10
Mines Royal ..	90	1,693 12 10	411	4,956 5 9	..	.. ..	371	5,216 5 3	872	11,866 3 10
B. Smith ..	40	593 0 0	538	9,629 7 6	129	2,172 5 0	785	15,949 11 6	1,492	28,344 4 0
British and Foreign } Copper Co. ..	..	.. ..	..	.. ..	207	3,319 1 5	535	8,597 0 9	742	11,916 2 2
Mason & Elkington }	..	.. ..	..	.. ..	..	.. ..	254	4,389 12 6	254	4,389 12 6
	7,803	97,781 5 6	14,925	206,206 8 6	9,563	104,914 1 6	11,212	157,694 0 6	33,595	564,595 16 0

PRODUCE of LEAD ORE and LEAD in the UNITED KINGDOM,  
for the Year 1848.

By ROBERT HUNT, Esq., Keeper of the Mining Records.

CORNWALL.				CUMBERLAND AND ALSTON MOOR—continued.			
MINES.	Lead Ore Returns.	Lead Retns.		MINES.	Lead Ore Returns.	Lead Retns.	
Callington ..	Tons 957 ..	632		Driggrith Beck Waste ..	30 ..	15	
Huel Mary Ann ..	334 ..	250		Dry Mill Mine ..	40 ..	27	
Huel Trelawny ..	413 ..	298		Greensides ..	1,560 ..	1,200	
Huel Trehane ..	422 ..	279		Woodend ..	36 ..	24	
Herodsfoot ..	721 ..	570		Force Cragg ..	43 ..	32	
East Huel Rose ..	5,333 ..	3,191		Keswick Mine ..	20 ..	14	
North Huel Rose ..	80 ..	49		Slaty Syke ..	47 ..	35	
Cargol ..	964 ..	577		Calvert ..	11 ..	6	
Oxnam ..	470 ..	288		Dozey ..	13 ..	9	
Huel Rose ..	399 ..	239		Slow Craig ..	25 ..	16	
Cubert ..	68 ..	41		Crossfell Mines ..	44 ..	30	
Holmbush ..	154 ..	90		Sundry, under 10 tons ..	20 ..	12	
Callestock ..	179 ..	110					
DEVONSHIRE.				DURHAM AND NORTHUMBER- LAND.			
Tamar ..	1,022 ..	631		E. and W. Allendale and			
Huel Adams ..	56 ..	30		Weardale ..	13,230 ..	9,080	
East Tamar Consols ..	237 ..	173		Teesdale Mines ..	3,327 ..	2,490	
Huel Friendship ..	9 ..	5		Yarnberry ..	100 ..	75	
Huel Betsey ..	6 ..	3		Silver Tongue ..	139 ..	95	
Lydford Consols ..	4 ..	2		Derwent Mines ..	1,480 ..	1,046	
CUMBERLAND AND ALSTON MOOR.				Stanhope Burn ..	220 ..	160	
Rampgill ..	424 ..	282		Holly-well ..	67 ..	48	
Scaleburn ..	238 ..	156		Lane Head ..	24 ..	17	
Carrs and Hanging Shaw ..	146 ..	97		Aller Gill ..	12 ..	8	
Capel Cleugh ..	139 ..	92		Bollihope ..	13 ..	9	
Small Cleugh ..	31 ..	21		Fallow-field ..	61 ..	45	
Middle Cleugh ..	30 ..	20		Whitfield ..	142 ..	105	
Guddamgill ..	50 ..	33		WESTMORELAND.			
Long Cleugh ..	1,664 ..	1,142		Dufton and Silverband ..	246 ..	184	
Browngill ..	603 ..	400		Hilton and Marton ..	273 ..	204	
Bentyfields Veins ..	35 ..	21		DERBYSHIRE.			
Cowperdyke Heads ..	14 ..	9		Sundry Mines ..	5,185 ..	3,370	
Brigalburn Veins ..	244 ..	162		SHROPSHIRE.			
Brownley Hill Veins ..	227 ..	143		Snailbeach ..	3,463 ..	2,436	
Bentfield Sun.V.E.Eng. ..	119 ..	80		White Grit and Batholes ..	506 ..	239	
Blagill Veins ..	76 ..	51		Bog Mine ..	139 ..	72	
Carrs West of Nent Vein ..	39 ..	26		Pennerley ..	22 ..	15	
Grass Fields Veins ..	31 ..	20		SOMERSETSHIRE.			
Galligill Syke Veins ..	176 ..	117		Mendip Hills ..	41 ..	29	
Galligill Burn ..	24 ..	16		YORKSHIRE.			
Hudgill Burn ..	188 ..	120		Swale Dale & Arkendale ..	4,053 ..	3,040	
Holyfields Veins ..	58 ..	38		Cononley ..	699 ..	437	
Wellgill Cross Vein ..	98 ..	66		Grassington & Garmbury ..	1,159 ..	707	
Rodderrup Cleugh West				Pateley District ..	937 ..	609	
End ..	1,470 ..	980					
Tyne Bottom Veins ..	80 ..	54					
Park Grove Sun Vein ..	21 ..	14					
Low Birchy Bank ..	19 ..	12					
Dowkeburn West End ..	95 ..	63					
Sundry mines und. 10 tons ..	44 ..	29					

## CARDIGANSHIRE.

MINES.	Lead Ore Returns.	Lead Retns.
Lisburne Mines	.. 2,434	.. 1,624
Cwm-ystwyth ..	.. 120	.. 71
Esgair-hir ..	.. 116	.. 70
Cwm-sebon ..	.. 31	.. 17
Llanfair ..	.. 80	.. 53
Goginan ..	.. 1,238	.. 816
Gogerddan Mines	.. 243	.. 162
Nant-y-creiau ..	.. 17	.. 10
Pen-y-bont-pren	.. 38	.. 22
Cefn-cwm-brwyno	.. 36	.. 24
Llwyn-malys ..	.. 51	.. 33
Bwlch-cwm-erfin	.. 40	.. 26
Bwlch Consols ..	.. 289	.. 192
Nanteos ..	.. 50	.. 30
Aberystwith, small mines	.. 20	.. 10
Llanymaron ..	.. 11	.. 5
Llanbadarn ..	.. 33	.. 18
Bron-berllan ..	.. 15	.. 7

## CARNARVONSHIRE.

Penrhyn-du ..	.. 21	.. 14
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## CARMARTHENSHIRE.

Nant-y-Mwyn ..	.. 307	.. 204
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## FLINTSHIRE.

Talargoch ..	.. 1,500	.. 980
Fronfownog ..	.. 1,695	.. 1,168
Hendre ..	.. 1,040	.. 838
Maes-y-safn ..	.. 1,138	.. 824
Pen-y-rhenblas ..	.. 1,160	.. 819
Mold Mines ..	.. 219	.. 153
Long Rake ..	.. 39	.. 21
Milwr ..	.. 117	.. 81
Dingle and Deep Level	887	.. 643
Pary's Mine ..	.. 21	.. 15
Trelogan ..	.. 15	.. 10
Westminster Mines	.. 659	.. 451
Halkin Hall ..	.. 39	.. 26
Garreg-y-boeth ..	.. 6	.. 4
Bodelwyddan ..	.. 106	.. 69
Belgrave ..	.. 375	.. 261
Bryng-gwyrrog ..	.. 11	.. 7
Jamaica ..	.. 835	.. 599
Bwlch-y-ddaufryn	.. 20	.. 16
Gwern-y-mynydd	.. 18	.. 13
Mostyn ..	.. 13	.. 8
Bagillt (ore sold at)	.. 46	.. 20
Billings ..	.. 45	.. 20
Caelanycraig ..	.. 14	.. 7

## FLINTSHIRE—continued.

MINES.	Lead Ore Returns.	Lead Retns.
Mostyn ..	.. 12	.. 5
Clwtmilitia ..	.. 26	.. 11

## MONTGOMERYSHIRE.

Llangynnog ..	.. 51	.. 31
Cae-conroy ..	.. 33	.. 20
Rhos-wydol ..	.. 26	.. 15
Dwn-gwm, or Dyfagwm	.. 13	.. 9
Craig-Rhiwarth ..	.. 27	.. 16
Bryndail and Pen-y-clyn	155	.. 100
Gorn ..	.. 43	.. 30
Machynlleth, including Delife ..	.. 545	.. 300
Nantmelyn ..	.. 19	.. 13
Frontballan ..	.. 15	.. 7

## MERIONETHSHIRE.

Cowarch ..	.. 74	.. 42
Tyddynglwadus ..	.. 18	.. 12

## IRELAND.

Newtonards ..	.. 616	.. 366
Conlig ..	.. 314	.. 179
Shallee ..	.. 340	.. 202
Glenmalure ..	.. 45	.. 39
Luganure ..	.. 422	.. 295
Barristown ..	.. 175	.. 116

## SCOTLAND.

Woodhead ..	.. 450	.. 320
Afton Lead Mines	.. 80	.. 56
Stroniton Mines	.. 236	.. 141
Cairnsmore ..	.. 476	.. 311
Black Craig ..	.. 86	.. 58
Lead Hills Mine	.. 300	.. 200
Wanlock Head ..	.. 960	.. 650

## ISLE OF MAN.

Foxdale Mines, including Peel's shipment, &c.	1,566	.. 1,034
Laxey ..	.. 695	.. 461
Douglas ..	.. 260	.. 170



TABLE showing the Total Quantity of LEAD ORE RAISED and LEAD SMELTED in the United Kingdom in 1848.

				Lead Ore.		Lead.	
				Tons		Tons	
Cornwall ..	..	..	..	10,494	..	6,614	
Devonshire ..	..	..	..	1,334	..	844	
Cumberland ..	..	..	..	8,272	..	5,684	
Durham and Northumberland ..	..	..	..	18,815	..	14,658	
Westmoreland ..	..	..	..	519	..	388	
Derbyshire ..	..	..	..	5,185	..	3,370	
Shropshire ..	..	..	..	4,130	..	2,762	
Somersetshire ..	..	..	..	41	..	29	
Yorkshire ..	..	..	..	6,848	..	4,793	
				55,638		39,142	

#### WALES.

Cardiganshire ..	..	..	..	4,902	..	3,180
Carnarvonshire ..	..	..	..	21	..	14
Carmarthenshire ..	..	..	..	307	..	204
Flintshire ..	..	..	..	10,056	..	7,069
Montgomeryshire ..	..	..	..	927	..	601
Merionethshire ..	..	..	..	92	..	54
				16,305		11,122

IRELAND ..	..	..	..	1,912	..	1,188
SCOTLAND ..	..	..	..	2,588	..	1,736
ISLE OF MAN ..	..	..	..	2,521	..	1,665

Making a Total of .. Tons 78,964 .. .. 54,853

#### LEAD ORE and LEAD IMPORTED and EXPORTED during 1848.

IMPORTED.—1,298 tons lead ore; pig and sheet-lead, 3,788 tons; retained for home consumption, 2,157 tons.

EXPORTED.—135 tons lead ore; pig and rolled lead, 4,977 tons; shot, 1,151 tons; litharge, red and white lead, 2,292 tons; foreign lead, in sheet and pig, 3,747 tons.

The WELSH SALES include also the following lead ores:—Australian 69 tons; Belgian, 85 tons; German, 44 tons; Portugal, 79 tons; Prussian, 112 tons; Sardinian, 112 tons.

The total amount of lead ore raised and sold in the United Kingdom for the year 1848 was 78,964 tons, and metallic lead sold 54,853 tons; while in 1847, the amount of lead ore 79,311 tons, and lead 53,410 tons—showing a decrease in the quantity of ore in 1848, as compared with a former year, of 347 tons, but an increase in the metal of 1,443 tons.

The price of English pig at the close of 1847 was £17. 10s. per ton, and at the same period of 1848, £15. 15s. per ton. A comparison of the two years thus shows no very great fluctuation in home trade; but, on referring to the imports and exports, we find a great increase in the latter year. The imports of lead ore in 1847 were 507 tons, and pig and sheet lead 394 tons, and the exports 86 tons of ore, and 3,435 tons of metal; while in 1848 the imports were 1,298 tons of ore, and 3,788 tons of metal; and the exports 135 tons of ore, and 6,128 tons of metal—showing an increase in the imports of 791 tons of ore, and 3,394 tons of metal; and in the exports of 49 tons of ore, and 2,693 tons of pig, sheet lead, and shot, and exclusive of manufactured metal in the shape of litharge and red and white lead.—[Editor.]

**PUBLIC SALES of TIN MINES in the Counties of CORNWALL**  
31st December, 1849.

Name of Mines.	First Quarter.						Second Quarter.					
	Quantity of Ore.			Amount of Money.			Quantity of Ore.			Amount of Money.		
	T.	c.	q. lb.	£.	s.	d.	T.	c.	q. lb.	£.	s.	d.
Great Polgooth .. ..	164	10	0 0	7,837	1	0	186	0	0 0	8,327	1	9
Polberrow .. ..	59	0	0 0	2,900	19	3	95	5	0 0	3,103	6	2
Charlestown .. ..	73	5	0 0	3,457	8	8	23	10	0 0	1,050	13	9
Wheal Essex .. ..	83	0	0 0	4,280	7	6	....	....	....	....	....	....
Tincroft .. ..	....	....	....	....	....	....	....	....	....	....	....	....
Lewis .. ..	15	15	2 18	850	4	4	....	....	....	....	....	....
Drake Walls .. ..	37	10	0 0	1,734	6	3	25	15	0 0	1,050	19	4
West Wheal Jewel .. ..	17	10	0 0	889	1	3	23	5	0 0	1,218	9	5
Wheal Anderton .. ..	19	5	0 0	933	12	6	10	0	0 0	481	2	6
Runnaford Combe .. ..	2	0	0 0	....	....	....	27	0	0 0	1,137	10	0
Ashburton United .. ..	14	2	1 8	723	1	7	9	10	2 12	401	10	0
Budwick Consols .. ..	28	0	0 0	1,453	2	5	....	....	....	....	....	....
Runnaford Combe .. ..	3	10	0 0	199	18	9	5	10	0 0	263	4	3
Wheal Friendship .. ..	20	16	0 0	824	10	0	....	....	....	....	....	....
West Wheal Providence .. ..	7	19	1 9	421	18	2	....	....	....	....	....	....
South Friendship .. ..	....	....	....	....	....	....	3	0	0 0	113	5	0
Kingston Downs .. ..	....	....	....	....	....	....	....	....	....	....	....	....
Beam Mine .. ..	....	....	....	....	....	....	....	....	....	....	....	....
Brick Tor .. ..	....	....	....	....	....	....	....	....	....	....	....	....
Wheal Anne .. ..	....	....	....	....	....	....	....	....	....	....	....	....
Wheal Bal .. ..	....	....	....	....	....	....	1	18	1 4	89	5	2
Mineral Court .. ..	....	....	....	....	....	....	....	....	....	....	....	....
	554	3	1 7	27,055	11	8	415	13	3 16	17,245	8	4

**COMPANIES BY WHOM**

	First Quarter.						Second Quarter.					
	Quantity of Ore.			Amount of Money.			Quantity of Ore.			Amount of Money.		
	T.	c.	q. lb.	£.	s.	d.	T.	c.	q. lb.	£.	s.	d.
Calenick Smelting Company	178	6	0 0	8,793	17	2½	100	0	0 0	4,205	6	3
Williams & Co. .. ..	125	0	0 0	6,449	19	5	83	1	2 18	3,610	8	11
Daubuz & Co. .. ..	75	5	0 0	3,645	19	8½	95	7	2 0	3,997	6	8
H. J. Enthoven & Co. ..	102	17	1 8	5,073	7	2	86	12	3 26	3,480	7	3
Bissee Company .. ..	39	0	0 0	1,822	5	8	50	11	2 18	2,051	19	3
Various .. ..	15	15	2 18	850	4	4	....	....	....	....	....	....
Union Smelting Company..	....	....	....	....	....	....	....	....	....	....	....	....
Treloweth Company ..	7	19	1 9	421	18	2	....	....	....	....	....	....
	544	3	1 7	27,005	11	8	415	13	3 16	17,245	8	4

The whole produce of Tin Mines in the Counties of Cornwall and Devon must not sales, to which we have access of information, while the greater portion is disposed of impracticable to obtain any accurate returns, and hence the imperfect table herewith

and DEVON, reported in the Official Returns for the year ending

Third Quarter.			Fourth Quarter.			Total.		
Quantity of Ore.	Amount of Money.		Quantity of Ore.	Amount of Money.		Quantity of Ore.	Amount of Money.	
T. c. q. lb.	£.	s. d.	T. c. q. lb.	£.	s. d.	T. c. q. lb.	£.	s. d.
170 0 0 0	6,819	2 6	180 0 0 0	7,464	5 0	700 10 0 0	30,477	11 3
79 10 0 0	3,097	3 9	71 10 0 0	2,831	7 6	295 5 0 0	11,932	16 8
11 0 0 0	440	17 6	10 0 0 0	406	1 10	117 15 0 0	5,355	1 9
....	....	....	....	....	....	83 0 0 0	4,280	7 6
67 18 3 20	2,559	13 11	30 9 0 16	1,338	18 2	98 8 0 8	3,898	12 1
44 19 2 10	1,955	6 1	28 0 0 7	1,041	0 2	88 15 1 7	3,846	10 7
....	....	....	22 17 1 16	932	11 0	86 2 1 16	3,717	16 7
14 0 0 0	558	5 0	14 0 0 0	585	5 0	73 15 0 0	3,261	0 8
10 0 0 0	428	4 4	9 0 0 0	399	2 6	48 5 0 0	2,242	1 10
7 0 0 0	308	0 0	3 0 0 0	123	7 6	37 0 0 0	1,568	17 6
3 15 1 14	146	19 5	4 10 3 2	182	13 3	31 19 0 8	1,463	4 3
....	....	....	....	....	....	28 0 0 0	1,453	2 5
9 10 0 0	390	5 0	4 0 0 0	188	0 0	22 10 0 0	1,041	8 0
....	....	....	2 0 0 0	69	0 0	22 16 0 0	893	10 0
....	....	....	....	....	....	7 19 1 9	421	18 2
2 3 0 0	79	2 6	4 15 0 0	196	5 7	9 18 0 0	388	13 1
4 0 0 0	117	0 0	4 3 0 0	132	8 6	8 3 0 0	249	8 6
....	....	....	4 4 3 24	214	12 0	4 4 3 24	214	12 0
....	....	....	4 10 0 0	209	4 0	4 10 0 0	209	4 0
2 10 0 0	96	11 3	....	....	....	2 10 0 0	96	11 3
....	....	....	....	....	....	1 18 1 4	89	5 2
1 9 0 27	68	10 6	....	....	....	1 9 0 27	68	10 6
427 16 0 15	17,065	1 9	406 10 1 9	16,314	2 0	1,794 3 2 19	77,6	

# THE ORES WERE PURCHASED.

Third Quarter.			Fourth Quarter.			Total.		
Quantity of Ore.	Amount of Money.		Quantity of Ore.	Amount of Money.		Quantity of Ore.	Amount of Money.	
T. c. q. lb.	£.	s. d.	T. c. q. lb.	£.	s. d.	T. c. q. lb.	£.	s. d.
70 18 2 19	2,819	10 6	70 14 2 19	2,907	18 2	319 19 1 10	18,726	12 1½
70 12 2 18	2,817	11 1	75 6 2 19	3,055	13 11	354 0 3 27	15,933	13 4
64 16 1 3	2,574	13 11	74 16 2 14	3,164	0 7	310 5 1 17	13,282	0 10½
48 13 3 18	1,949	9 5	46 1 3 21	1,872	4 3	287 6 0 7	12,375	8 1
56 0 3 9	2,241	17 5	53 2 2 20	2,163	13 2	198 14 3 27	8,279	15 6
3 15 0 14	146	19 5	74 19 3 25	2,685	19 0	94 10 3 1	3,683	2 9
112 18 2 18	4,515	0 0	11 7 3 23	464	12 11	124 6 2 13	4,979	12 12
....	....	....	....	....	....	7 19 1 9	421	18 2
427 16 0 15	17,065	1 9	406 10 1 9	16,314	2 0	1,794 3 2 19	77,680	3 9

be estimated by the above returns, inasmuch that such only relate to the public by private contract. Since the repeal of the coinage duty in 1838, it has been found presented.

## CORNISH COPPER ORES.

Annual average Produce, Price, and Standard for nine years, from 1841 to 1849, inclusive, of Copper Ores sold at Cornish ticketing, with the highest and lowest prices of Cake Copper in each year.

Year.	Standard.			Produce.	Price.			Cake Copper—per Ton.			
	£.	s.	d.		£.	s.	d.	£.	£.	s.	d.
1841	125	1	0	7½	6	5	0	100	to	95	0 0
1842	112	18	0	7½	5	12	1	96	to	83	0 0
1843	109	8	0	7½	5	10	0	88	to	78	10 0
1844	107	8	0	7½	5	4	9	88	to	88	3 0
1845	106	2	0	7½	5	13	0	93	to	84	0 0
1846	102	2	0	7½	5	5	10	93	to	83	10 0
1847	103	11	0	8½	5	14	1	98	to	93	0 0
1848	90	13	0	8½	4	18	9	93	to	87	0 0
1849	99	18	3	8	5	4	3	86	to	79	10 0

## DECLARED VALUE of EXPORTS of BRITISH &amp; IRISH METALS for the Years ending 5th Jan. 1847, 1848, 1849, and 1850.

	1847.	1848.	1849.	1850.
	£.	£.	£.	£.
Iron and steel ..	4,178,026	5,265,779	4,747,009	4,966,973
Copper and brass ..	1,558,187	1,541,868	1,272,675	1,204,301
Lead .. ..	147,170	179,344	117,181	287,337
Tin unwrought ..	107,456	159,466	143,436	141,577
Tin plates ..	639,223	462,889	530,061	711,649

## EXPORTS of ENGLISH and IRISH METALS and MINERALS.

The following particulars are extracted from an account of the exports of the principal articles of British and Irish produce and manufactures in the twelve months ending on the 5th January, 1846, 1847, 1848, 1849, and 1850.

	1846.	1847.	1848.	1849.	1850.
	£.	£.	£.	£.	£.
Coals, culm ..	973,635	971,174	976,377	1,088,221	1,088,148
Earthenware ..	828,182	793,166	834,151	722,012	807,466
Glass .. ..	357,421	262,547	292,038	237,573	277,175
Hardware, cutlery	2,183,000	2,180,587	2,346,255	1,860,150	2,198,597
Machinery ..	904,961	1,117,470	1,228,091	234,132	154,707
Iron, steel ..	3,501,895	4,178,026	5,272,942	4,777,965	4,947,643
Copper, brass ..	1,694,441	1,558,187	1,467,498	1,257,945	1,863,287
Lead .. ..	210,974	147,170	181,771	115,547	287,337
Tin, unwrought..	48,777	107,456	159,098	143,085	141,577
Tin plates ..	615,729	639,223	459,265	532,142	711,649
Salt .. ..	218,302	205,005	260,591	266,480	254,126

The total amount of exports shows—in 1846, £53,298,026; in 1847, £51,227,060; in 1848, £50,897,790; in 1849, £48,946,325; and in 1850, £58,848,042.



**EXPORTS of METALS to ALL INDIA from LONDON and  
LIVERPOOL, for the Years 1847, 1848, and 1849.**

		1847.	1848.	1849.	In. in 1849.
Spelter .. ..	<i>Tons</i>	3,244 ..	3,019 ..	4,041 ..	1,022
Copper .. ..		3,553 ..	3,652 ..	6,153 ..	2,501
Iron, British .. ..		10,976 ..	20,617 ..	37,448 ..	16,831
Ditto, foreign .. ..		847 ..	339 ..	2,320 ..	1,981
Tin plates .. ..	<i>Boxes</i>	7,308 ..	4,024 ..	14,832 ..	10,808
Lead .. ..	<i>Tons</i>	1,099 ..	926 ..	3,230 ..	2,304
Steel .. ..		552 ..	295 ..	990 ..	695
Quicksilver .. ..	<i>Bottles</i>	50 ..	45 ..	407 ..	362

**IMPORTS of SPECIE.**

A return made up for the year ending the 31st December last, of the importation of specie and bullion into the port of Southampton by the mail steamers, shows that the receipts have amounted to no less a sum than \$33,943,275, or £6,788,655 sterling. The subjoined table shows the receipts:—

**GOLD and SILVER COIN and BULLION—IMPORTS for the Year ending Dec. 31, 1849.**

From Mexico, Central America, Chili, Peru, Bolivia, New Granada, California, &c...	£4,648,270
From Alexandria .. ..	728,851
From Constantinople .. ..	933,510
From Spain and Portugal .. ..	310,000
From other parts .. ..	168,025
<b>Total .. ..</b>	<b>£6,788,656</b>

**COAL and LEAD IMPORTS of the UNITED STATES.**

**LEAD.**—The import of foreign lead into the United States from February 28, 1849, to December 28, 1849, was:—From Liverpool, London, &c., 89,962 pigs; from France, 19,591; from Spain, 65,316; from Holland and Belgium, 3,965; from Austria, 4,100—total, 182,934 pigs, or 12,195 tons, at 15 pigs to the ton, or equal to 365,868 American pigs. Of the above, New York has received 152,803 pigs, or 10,180 tons.

**COAL.**—The amount and value of coal imported into the United States during the year ending the 30th June, 1849, was:—From England, 63,079 tons, value \$156,154; from Scotland, 1,469 tons, value \$2,721; from Ireland, 600 tons, value \$1,437; British American colonies, 131,565 tons, value \$245,693; and from other places, 1,500 tons, value \$3,277—total, 198,213 tons, of the value of \$409,282.

The following table shows the imports of foreign coal into the United States annually, from 1821 to the 1st July, 1849. The duty on foreign coal under the present tariff is 30 c. to 45 c. per ton on board:—

1821 .. ..	22,122	1836 .. ..	108,432
1822 .. ..	34,523	1837 .. ..	153,450
1823 .. ..	30,433	1838 .. ..	129,083
1824 .. ..	7,228	1839 .. ..	181,551
1825 .. ..	25,645	1840 .. ..	162,867
1826 .. ..	35,665	1841 .. ..	155,394
1827 .. ..	40,257	1842 .. ..	141,526
1828 .. ..	32,302	1843 .. ..	41,163
1829 .. ..	45,393	1844 .. ..	87,073
1830 .. ..	58,136	1845 .. ..	85,771
1831 .. ..	36,508	1846* .. ..	156,855
1832 .. ..	72,978	1847† .. ..	148,021
1833 .. ..	92,432	1848 .. ..	196,251
1834 .. ..	71,626	1849 .. ..	198,213
1835 .. ..	49,969		

\* From Dec. 1, 1846, to June 30, 1847.

† For the year ending June 30, 1848.

## COPPER-SMELTING ESTABLISHMENTS.

	1. Mines Royal Company.	2. Vivian and Sons.	3. Freeman and Company.	4. Pascoe Grenfell and Sons.
Cashier ..	J. W. Bevan	Oct. Williams	H. M. Grylls	Alfred Jenkin
Assayer ..	J. W. Bevan	Steph. Williams	S. Michell	S. Mitchell
Sample-taker	Alex. Vivian	Henry Williams	R. Hichens	James Angrove
Clerk.. ..	Charles Bone	John Hernaman	W. M. Grylls	Silvanus Jenkins
	5. Williams's Crown Copper Co.	6. Sims, Wilyams, and Company.	7. Williams, Foster, and Company.	8. John Schneider and Company.
Cashier ..	W. Williams	H. Wilyams	M. Williams	John Penrose
Assayer ..	W. Andrew	J. Christoe	J. Andrew	John Penrose
Sample-taker	A. Pryor	W.H.Tregoning	A. Pryor	E. Angove
Clerk.. ..	A. Skewes	R. Christoe	A. Skewes	R. Sampson

## TIN-SMELTING ESTABLISHMENTS.

Name of Works.	Proprietors.	Name of Works.	Proprietors.
Calenick .. ..	Michell & Co.	Trethellan, Millineur	{ Williams, Har- vey, & Co.
Carodras, Treloweth	Daubuz & Co.	Tamar .. ..	Union Company
Charlestown House..	Enthoven & Sons	Brisol .. ..	Tregoning & Co.
Angarrack, Chyandour	Bolithos & Co.		

## FLUCTUATIONS in the STOCK and SHARE MARKET, during the Year 1849.

STOCKS AND SHARES.	Jan. 1, 1849.	Highest.	Lowest.	Jan. 1, 1850.
Consols .. ..	88 $\frac{3}{4}$ ex div.	96 $\frac{3}{4}$ ex div.	89 $\frac{3}{4}$	96 $\frac{1}{2}$
Exchequer Bills .. ..	42s. pm.	61s. pm.	35s. pm.	60s. pm.
RAILWAYS:—				
Brighton .. ..	64 $\frac{1}{2}$	82 $\frac{3}{4}$	63	79
Birmingham and Oxford	25 $\frac{1}{2}$	26 $\frac{1}{4}$	24	26
Caledonian .. ..	22 $\frac{1}{2}$	27	10	10 $\frac{3}{4}$
Eastern Counties .. ..	11 $\frac{7}{8}$	12 $\frac{1}{4}$	6 $\frac{3}{4}$	6 $\frac{7}{8}$
Great Western .. ..	91	105 $\frac{3}{4}$	48	58
London and North-Western	126	143	104 $\frac{3}{4}$	111
Midland .. ..	87	99 $\frac{1}{2}$	42 $\frac{1}{2}$	45
North Staffordshire .. ..	13 $\frac{1}{2}$	17 $\frac{1}{4}$	7 $\frac{1}{4}$	7 $\frac{1}{2}$
South-Eastern .. ..	24	26 $\frac{1}{2}$	16 $\frac{1}{4}$	18 $\frac{3}{4}$
South-Western .. ..	84	89	55	60 $\frac{1}{2}$
York and North Midland	55	59 $\frac{1}{2}$	16 $\frac{1}{2}$	18
Boulogne and Amiens .. ..	8 $\frac{1}{4}$	10 $\frac{1}{8}$	5	7 $\frac{3}{8}$
Northern of France .. ..	10 $\frac{1}{2}$	14 $\frac{1}{8}$	9 $\frac{1}{4}$	12 $\frac{1}{2}$

## THE METAL TRADE.

Prices of the following on the 31st December of each year.

	1842.	1843.	1844.	1845.
Spelter .....	£27 10 to £28 0	£22 5 to £22 10	£22 12 6 to £22 15	£20 10 0 to £21 0
English Bar Iron.....	5 15 to 5 10	5 0 —	6 15 0 —	9 15 0 —
Pig Iron, in Wales .....	3 15 —	3 5 —	4 0 0 —	5 0 0 to 5 15
" at Glasgow .....	2 7 6 to 2 10	2 3 —	3 2 6 —	4 2 6 to 4 5
Swedes Iron .....	11 10 0 to 12 0	10 10 —	10 0 0 —	11 10 0 to 12 0
Swedish Keg Steel .....	£18 —	17 10 —	16 0 0 —	15 0 0 —
Copper, Eng. Sheathing.. per lb.	9½d.	9½d.	9½d.	10½d.
" Cake..... per ton	£84	£86	£84	£93
Tin, English Block .... per cwt.	£63 to £65	70s.	71s.	103s.
" Foreign Banca .....	67s. 6d.	70s. to 72s.	65	92
Straits.....	60s. to 61s.	70s.	63	91
Tin Plates, IC..... per box	26 to 29	23s. 6d. to 27s.	25s. to 31s.	29s. to 33s.
Lead, English Pig ..... per ton	£17 5 to £17 10	£17 10 —	£16 15 —	£19 10
" Spanish .....	17 5 —	16 10	16 0 to £16 10	18 10
	1846.	1847.	1848.	1849.
Spelter .....	£19 12 6 to £19 15	£19 10 to £20 0	£15 0 0 —	£16 10
English Bar Iron.....	10 0 0 —	8 5 to 8 10	6 0 0 to £6 5	6 0
Pig Iron, in Wales .....	4 5 0 to 5 5	3 5 to 4 10	3 15 0 to 4 5	£3 5 to £3 10
" at Glasgow .....	3 17 6 to 4 0	2 5 to 2 8	2 7 6 to 2 8	£2 9
Swedes Iron .....	11 10 0 —	11 5 —	11 0 0 to 12 0	11 0
Swedish Keg Steel .....	15 0 0 to 15 10	14 0 —	13 10 0 to 14 0	15 0
Copper, Eng. Sheathing.. per lb.	10d.	11d.	9d.	9½d.
" Cake..... per ton	£88 10	£98	£79 10	£84
Tin, English Block .... per cwt.	98s.	82s.	78½s.	80s.
" Foreign Banca .....	102	84	86	80
Straits.....	98	80	82	77
Tin Plates, IC..... per box	27s. to 33s.	23s. to 30s.	26s. to 30s.	28s. to 37s.
Lead, English Pig ..... per ton	£19 10	£17 15 —	£16 0 to £16 5	£16 5 to £16 10
" Spanish .....	17 10	17 0 to £17 5	14 15 to 15 10	15 0 to 15 10

PRODUCE of MINES in CORNWALL and DEVON for 1849.

No. 1. M I N E S.	QUARTER ENDING												TOTALS.		
	March 31.			June 30.			September 30.			December 31.					
	Tons.	£.	s. d.	Tons.	£.	s. d.	Tons.	£.	s. d.	Tons.	£.	s. d.			
Devon Great Consols ..	4,509	25,551	10 6	3,923	23,449	0 6	3,546	22,873	18 6	3,799	25,060	3 6	15,777	96,984	13 0
Carn Brea ..	2,440	16,145	3 6	2,560	15,574	0 0	2,631	17,297	8 0	2,455	17,925	15 0	10,086	66,642	6 6
Par Consols ..	1,881	11,541	0 6	1,989	11,079	1 6	1,898	10,334	16 6	1,604	10,147	11 6	7,372	43,102	10 0
Great Consolidated ..	2,604	12,909	1 0	1,235	6,125	2 0	2,732	15,362	9 6	1,335	7,466	8 6	7,906	41,863	1 0
Great United ..	2,837	11,738	15 6	3,304	12,376	3 0	2,835	10,535	14 6	3,252	12,598	8 0	12,228	47,249	1 0
Fowey Consols ..	1,579	8,952	12 0	1,760	10,066	18 6	1,444	8,043	4 6	1,483	9,379	5 0	6,266	36,442	0 0
West Caradon ..	1,003	7,433	19 6	1,052	8,089	18 6	961	7,061	18 0	950	7,288	3 6	3,966	29,872	10 6
North Pool ..	1,672	7,073	8 6	1,790	8,195	4 0	1,441	5,858	0 6	1,584	6,060	8 0	6,487	27,717	1 0
North Roskar ..	1,890	8,226	18 6	—	—	—	1,884	8,473	4 6	960	5,171	1 6	4,734	21,871	4 6
Wheal Seton ..	948	4,305	0 6	1,188	5,311	13 0	1,163	5,072	13 6	1,654	6,886	18 0	1,953	21,576	5 0
South Wheal Bassett ..	518	4,036	1 6	855	5,715	12 0	525	3,780	6 0	1,118	7,321	4 6	3,016	20,853	8 6
Wheal Prosper and Friendship ..	701	5,404	16 0	647	4,771	0 0	616	4,847	13 0	552	4,106	4 0	2,516	19,183	13 0
Tywarhale and Nancekuke ..	950	4,350	5 6	1,228	5,137	2 6	1,367	5,016	0 6	1,219	4,214	6 6	4,764	18,717	15 0
South Wheal Francis ..	396	4,105	8 0	493	4,451	18 6	536	5,131	0 6	419	3,860	9 6	1,844	17,448	16 6
Tincroft ..	104	3,417	11 6	1,048	4,202	15 6	1,538	4,791	18 0	1,355	4,639	9 6	4,045	17,051	14 6
Trevisky and Barrier ..	838	5,710	2 6	459	2,993	5 6	703	4,544	13 0	421	3,201	9 0	2,421	15,849	10 6
South Caradon ..	737	517	7 6	772	5,172	6 0	—	—	—	708	4,993	19 0	2,217	15,337	12 6
East Wheal Crofty ..	646	3,056	13 6	955	4,429	16 0	601	2,358	9 0	1,015	4,696	15 0	3,217	14,541	13 6
Stray Park, Camborne, Vean, } and Wheal Francis	435	1,635	17 6	901	3,811	13 0	424	1,694	0 6	1,015	4,354	4 0	2,775	11,495	15 0
Tresavean ..	903	3,627	12 6	817	2,610	12 6	912	3,092	11 0	702	2,153	5 0	3,334	11,484	1 0
Levant ..	441	2,369	5 6	255	1,564	7 6	658	4,273	0 0	550	2,766	6 0	1,904	10,972	13 6
Bedford United ..	343	1,908	0 0	343	2,342	15 6	368	2,875	1 6	361	2,968	9 6	1,415	10,154	6 6
West Wheal Buller ..	102	929	17 0	352	2,637	4 6	289	2,433	7 6	442	2,967	12 6	1,165	8,968	2 0
South Roskar and Wheal Pance	429	1,679	12 6	1,095	5,553	19 6	231	982	16 6	84	259	4 0	1,839	8,475	12 6
Condurow ..	221	889	8 0	556	2,606	17 6	247	1,180	1 0	469	2,881	8 6	1,493	7,647	15 0
Wheal Mary ..	265	1,291	11 6	348	1,845	6 6	232	942	9 6	407	2,377	2 0	1,342	7,456	9 6
Wheal Comfort ..	582	1,822	2 6	764	1,527	0 0	776	1,888	9 0	962	2,166	8 6	3,084	7,404	0 0



## PRODUCE OF MINES in CORNWALL and DEVON for 1849—continued.

No. 2. MINES—continued.	QUARTER ENDING												TOTALS.		
	March 31.			June 30.			September 30.			December 31.					
	Tons.	£.	s. d.	Tons.	£.	s. d.	Tons.	£.	s. d.	Tons.	£.	s. d.			
West Wheal Treasury ..	382	1,701	18 0	320	1,678	10 6	371	1,959	0 6	289	1,577	18 0	1,362	6,897	7 0
Treleigh Consols ..	329	1,993	14 0	282	1,979	17 6	298	1,542	18 6	345	1,356	9 6	1,254	6,872	19 6
Wheal Agar ..	418	1,435	4 6	379	1,218	7 6	394	1,658	13 0	312	1,582	12 0	1,503	6,894	17 0
South Tolgus ..	250	1,387	15 0	121	623	16 6	344	1,859	6 0	247	1,800	10 6	962	5,671	8 0
Dolcooth ..	158	656	6 6	333	1,575	17 6	176	774	12 6	361	2,193	16 6	1,028	5,200	13 0
Perran St. George ..	221	1,288	16 0	135	785	8 0	304	2,375	1 6	168	747	10 6	828	5,196	16 0
Wheal Tremayne ..	329	1,068	0 6	397	1,172	17 6	518	1,564	10 0	402	1,225	0 6	1,646	5,030	8 0
Wellington ..	90	651	2 6	220	1,387	4 0	118	711	13 6	244	1,503	11 6	672	4,253	11 6
Marke Valley ..	150	407	3 0	491	1,509	6 0	246	828	2 0	472	1,438	5 6	1,359	4,182	16 6
East Pool ..	185	648	17 6	415	1,394	6 6	156	454	10 0	380	1,641	16 0	1,136	4,139	10 0
West Wheal Seton ..	112	601	17 6	253	1,463	3 0	140	773	10 0	234	1,142	14 0	739	3,981	3 0
Poldice ..	240	1,022	10 6	111	491	5 6	303	1,513	1 6	137	672	18 6	791	3,699	16 0
Creegbrann ..	237	886	18 0	238	1,158	14 6	238	1,196	5 0	54	129	10 0	767	3,371	7 6
Trethellan ..	355	991	4 0	246	445	4 0	454	1,145	17 6	232	550	2 6	1,287	3,132	8 0
West Fowey Consols ..	93	703	3 0	80	376	0 0	100	645	0 0	186	1,087	6 0	459	2,911	9 0
Holmbush ..	50	266	5 0	167	917	15 6	76	412	6 0	161	760	6 6	454	2,356	13 0
Wheal Ellen ..	161	1,058	7 6	81	379	8 6	120	608	9 0	41	238	9 0	403	2,284	14 0
Wheal Mary Consols ..	227	1,170	18 0	123	479	12 6	161	627	14 6	—	—	—	511	2,296	5 0
Wheal Henry ..	—	—	—	—	—	—	240	1,401	6 6	98	454	8 0	338	1,853	9 6
Gambler and St. Aubyn ..	151	686	3 6	53	213	6 6	140	728	10 6	54	119	15 0	398	1,827	15 6
Charlestown United ..	72	599	8 0	70	422	15 0	113	797	19 0	—	—	—	255	1,820	2 0
West Wheal Jewel ..	66	221	8 0	154	538	15 0	63	210	13 6	137	601	7 0	400	1,617	3 6
Wheal Pink ..	55	268	2 6	130	639	5 0	54	201	3 0	115	453	19 6	354	1,562	10 0
South Wheal Fortune ..	31	172	10 6	49	545	7 0	22	170	10 0	93	513	15 0	195	1,402	2 6
Wheal Basset ..	—	—	—	—	—	—	172	1,264	1 0	—	—	—	172	1,264	1 0
Phoenix Mines ..	22	236	10 0	38	238	7 6	30	169	12 0	58	317	11 0	150	962	0 6
West Trethellan ..	34	105	8 0	58	181	8 0	40	157	0 0	107	382	6 6	239	826	2 6
Wheal Vyvian ..	36	180	18 0	36	179	2 0	116	343	14 0	49	175	0 0	237	887	14 0

## PRODUCE of MINES in CORNWALL and DEVON for 1849—continued.

No. 3. MINES—continued.	QUARTER ENDING												TOTALS.
	March 31.			June 30.			September 31.			December 31.			
	Tons.	£. s. d.	Tons.	£. s. d.	Tons.	£. s. d.	Tons.	£. s. d.	Tons.	£. s. d.	Tons.	£. s. d.	
South Crinnis ..	101	512 7 6	—	—	—	—	—	—	55	275 0 0	156	787 17 6	
Wheal Maiden ..	41	172 18 6	24	93 0 0	76	327 1 0	30	149 5 0	171	742 4 6	171	742 4 6	
Alfred Consols ..	128	349 19 0	38	68 8 0	30	79 8 0	60	189 14 0	256	687 9 0	256	687 9 0	
Great Work ..	—	—	95	650 0 0	—	—	—	—	—	—	95	650 0 0	
Wheal Bucketts ..	119	425 4 6	70	205 10 0	—	—	—	—	—	—	189	630 14 6	
Wheal Busy ..	59	185 14 6	54	129 15 0	58	160 11 0	37	103 12 0	208	579 12 6	208	579 12 6	
Wheal Penhale ..	—	—	—	—	45	273 7 6	51	296 9 0	96	569 17 0	96	569 17 0	
Wheal Jewel ..	28	108 3 0	18	82 9 0	43	187 6 6	11	58 15 6	100	436 14 0	100	436 14 0	
Wheal Providence ..	72	193 17 6	60	151 10 0	—	—	32	78 8 0	164	423 15 6	164	423 15 6	
Polberrow ..	—	—	—	—	—	—	—	—	—	—	35	416 10 0	
Gonamena ..	—	—	—	—	—	—	—	—	—	—	60	339 0 0	
South Wheal Fortune ..	—	—	—	—	—	—	—	—	—	—	43	308 1 0	
Wheal Bands ..	—	—	—	—	—	—	—	—	—	—	73	251 6 0	
Wheal Neptune ..	—	—	15	117 15 0	8	62 0 0	10	70 5 0	33	250 0 0	33	250 0 0	
Richard's Ore ..	—	—	—	—	—	—	—	—	119	246 15 0	119	246 15 0	
Wheal Clifford ..	—	—	—	—	—	—	—	—	79	237 1 0	79	237 1 0	
North Wheal Darlington ..	—	—	—	—	—	—	—	—	38	219 15 0	38	219 15 0	
St. Aubyn and Grylls ..	—	—	—	—	14	94 10 0	22	123 15 0	36	218 5 0	36	218 5 0	
Hawke's Point ..	—	—	—	—	—	—	—	—	44	214 2 6	44	214 2 6	
Tamar Slag ..	—	—	—	—	—	—	—	—	36	207 0 0	36	207 0 0	
St. Ive's Consols ..	—	—	—	—	—	—	—	—	26	201 12 6	26	201 12 6	
Botallack ..	—	—	—	—	—	—	—	—	20	177 10 0	20	177 10 0	
Trenance ..	—	—	—	—	—	—	—	—	16	154 0 0	16	154 0 0	
Carthew Consols ..	—	—	—	—	—	—	—	—	37	150 17 0	37	150 17 0	
Wheal Tremwith..	—	—	—	—	—	—	—	—	17	144 18 6	17	144 18 6	
Sundry Mines, No. 4 ..	—	—	—	—	—	—	—	—	731	2,506 9 0	731	2,506 9 0	
	Total for 12 months										145,604	761,108 10 0	

NOTE.—There will be found a slight variation on comparing the above with other returns, but of no considerable value, such being unavoidable.

The following MINES have also made RETURNS during the past Year. No. 4.

	Tons.	Amount.			Tons.	Amount.		
		£.	s.	d.		£.	s.	d.
Andrew and Nangiles ..	46	143	7	6	Brought forward ..	2,096	8	0
Sundry slags and regulus ..	71	137	10	0		5	30	0
Pogooth ..	21	137	2	0		4	28	0
Wheal Rodney ..	89	136	12	6		10	27	0
Wheal Union ..	15	123	9	6		10	26	15
Wheal Pleasant ..	23	115	11	6		5	25	2
North Downs ..	27	109	6	6		12	23	14
Prideaux Wood ..	35	106	15	0		6	21	18
Wheal Rose ..	19	104	19	6		5	21	15
Camborne Consols ..	12	102	13	0		6	18	15
Wheal Prosper ..	43	99	7	6		4	18	12
Lewis Mines ..	18	81	0	0		16	18	5
Godolphin ..	22	72	3	6		5	17	2
Wheal Brewer ..	30	68	19	6		7	16	2
East Wheal Seton ..	24	66	12	0		3	16	7
Wheal Providence ..	9	61	13	0		3	15	6
Wheal Virgin ..	20	58	19	0		2	15	12
Wheal Harriet ..	12	56	2	0		5	13	0
Wheal Friendship ..	3	55	4	0		4	12	14
Wheal Tryphena ..	6	51	15	0		3	9	12
Colom's Ore ..	17	48	0	6		4	8	16
East Downs ..	9	43	17	6		2	8	14
Wheal Speedwell ..	12	39	12	0		4	6	0
Francis Ore ..	12	38	2	0		4	5	18
East Grinnis ..	5	37	8	6		2	5	0
Carried forward ..	600	2,096	8	0	Total ..	731	2,506	9
								0

**LIST of DIVIDENDS PAID in CORNWALL and DEVON MINES,**  
In TWELVE MONTHS, ending Dec. 31, 1849.

MINES.	Amount.	Div. per Share.	Paid up.	Price.
Devon Great Consols .. ..	£34,304	£33 10 0	£ 1	£190
Par Consols .. ..	19,200	150 0 0	900	800
East Wheal Rose .. ..	17,920	140 0 0	50	625
Carn Brea .. ..	15,000	15 0 0	15	110
North Pool .. ..	11,750	117 10 0	45	500
South Frances .. ..	7,192	58 0 0	160	300
Levant .. ..	6,720	42 0 0	—	170
South Basset .. ..	6,400	50 0 0	—	450
Tamar Consols .. ..	5,760	0 12 0	3	8
Wheal Margaret .. ..	4,368	39 0 0	—	210
Great Polgooth .. ..	5,504	21 10 0	150	300
Wheal Friendship .. ..	3,840	30 0 0	—	—
West Caradon .. ..	3,840	15 0 0	20	100
Wheal Trelawney .. ..	3,640	14 0 0	7½	85
Treviskey .. ..	3,120	26 0 0	130	140
Bedford United .. ..	3,000	0 15 0	2½	4½
Great Work (Tin) .. ..	2,677½	22 10 0	—	—
Trehane .. ..	2,688	10 10 0	1	31
West Buller .. ..	2,560	20 0 0	10	380
West Providence .. ..	2,048	8 0 0	1	30
Tincroft .. ..	2,100	0 7 0	7	12
Providence Mines .. ..	3,640	32 10 0	—	—
Balleswiddin .. ..	2,760	1 14 0	—	—
United Mines .. ..	2,000	10 0 0	—	—
Comfort .. ..	1,654	13 0 0	—	90
North Roskear .. ..	1,120	8 0 0	10	300
Wheal Seton .. ..	1,584	8 0 0	75	280
Stray Park .. ..	1,000	1 0 0	40	22
Great Consols .. ..	960	10 0 0	1,000	220
Wheal Wellington .. ..	896	3 10 0	—	—
Condurrow .. ..	768	3 0 0	—	90
Boscawell .. ..	800	12 10 0	—	—
Spearne Consols .. ..	656	5 2 6	—	—
Wheal Mary Ann .. ..	640	1 5 0	—	33
South Caradon .. ..	640	5 0 0	5	400
Wheal Tremayne .. ..	512	0 10 0	9½	5½
East Crofty .. ..	470	5 0 0	—	65
St. Ives Consols .. ..	470	5 0 0	—	—
Wheal Franco .. ..	388	1 0 0	—	—

Total Dividend paid on 38 mines, £184,589. 10s.

PAID on WELSH and other MINES,  
during the same period.

Lisburne..... £6,000 .. £60 per share.  
Goginan ..... 4,000 .. 40 „

Total.. £10,000

**IRISH MINE.**

Wicklow Copper .. £2,750 .. 10s. per sh.  
£5 paid .. £8 price.

**FOREIGN MINES.**

Cobre Copper .. .. £48,000 0 0  
St. John del Rey .. .. 29,000 0 0  
United Mexican .. .. 4,940 5 0

Total .. £81,940 5 0

**Making a GRAND TOTAL of**

Cornwall and Devon ..	£184,589	10	0
Foreign .. ..	81,940	5	0
Welsh .. ..	10,000	0	0
Irish .. ..	2,750	0	0

Grand Total.. £279,280 2 0

Other mines, which are chiefly private  
speculations, have paid dividends.

The dividends on mines in Cornwall,  
to the accounts of which we have access,  
amounted in the year ending—

Dec. 31, 1836 to	£158,838	0	on 28 mines.
Dec. 31, 1847 „	155,381	0	on 30 mines.
Dec. 31, 1848 „	129,024	0	on 22 mines.
Dec. 31, 1849 „	181,589	10	on 38 mines.



# IMPORTS OF METALS for 1846, 1847, and 1848, from Parliamentary Returns made up to 5th January, 1849.

1846.

1847.

	Month ending 5th Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Jan.	Total.
Copper ore .... tons	3,456	4,914	3,992	3,756	2,411	6,226	4,196	5,370	6,703	2,090	4,481	4,029	51,624
— unwrought cwts.	..	55	171	198	55	1,529	60	566	5,367	2	64	1,234	9,331
Iron in bars .... tons	233	650	440	1,687	2,015	5,529	2,691	5,544	4,485	2,498	2,733	6,199	34,633
Steel, u. w. .... cwts.	160	266	3,367	3,226	304	1,008	2,402	2,094	997	872	1,610	2,160	18,466
Lead, pig, &c. .... tons	404	430	365	367	374	638	619	866	1,349	727	1,166	1,166	7,863
Spelter .....	56	94	448	799	906	1,026	206	468	787	371	865	1,220	7,245
Tin in blocks .... cwts.	992	705	2,245	1,558	2,658	669	548	4,007	1,415	484	130	4,896	20,306
Quicksilver .... lbs.	169,076	..	..	187,836	571,095	..	..	227,224	190,005	229,009	929	265,399	1,840,583
1847.													
Copper ore .... tons	930	2,385	3,499	2,145	4,917	4,962	2,776	3,737	3,301	2,502	3,886	6,452	41,401
— unwrought cwts.	..	2,721	385	..	..	808	364	..	1,073	..	2,731	2,182	10,265
Iron in bars .... tons	758	7	224	538	2,040	1,574	6,058	5,533	6,351	3,181	3,044	4,010	33,317
Steel, u. w. .... cwts.	953	..	628	..	..	3,848	2,002	2,217	1,058	1,469	478	433	13,097
Lead, pig, &c. .... tons	6	612	246	74	328	126	112	213	755	443	251	766	3,932
Spelter .....	33	35	251	328	879	2,313	1,344	2,793	1,057	1,487	843	505	12,769
Tin in blocks .... cwts.	..	1,455	2,850	512	1,713	1,119	5,032	2,751	904	3,412	..	3,561	23,307
Quicksilver .... lbs.	396,742	76	..	209,912	220,031	181,044	264,096	610,091	..	248,743	402,471	9,651	2,542,857
1848.													
Copper ore .... tons	1,524	5,039	5,672	2,876	5,415	5,965	5,192	2,612	5,656	1,687	3,397	..	14,167
Do. 11 & 12 Vict. ..	..	..	..	..	..	..	..	..	..	..	..	5,122	35,981
— unwrought cwts.	..	..	..	..	..	2,607	1,387	4,148	..	573	..	245	10,255
Iron in bars .... tons	1,070	323	573	716	773	2,784	2,546	2,877	3,771	3,314	2,862	1,787	23,396
Steel, u. w. .... cwts.	..	2,307	300	13	..	897	573	206	654	405	79	1,064	6,755
Lead, pig, &c. .... tons	..	553	101	33	603	252	550	387	383	225	205	516	3,507
Spelter .....	84	18	408	285	2,427	1,772	1,301	1,262	971	1,106	1,428	2,302	13,423
Tin in blocks .... cwts.	..	16	706	356	..	291	..	..	1,310	1,891	929	1,253	6,733
Quicksilver .... lbs.	..	..	139,801	247,561	150,101	..	210,729	462,933	428,514	..	..	58,024	1,562,663



## SHARE LIST of BRITISH and FOREIGN MINES.

Shares.	Company.	Paid.	Total Cost.	Price.	Market Value.
		£.	£. s.	£.	£. s.
1,000	Abergwessin .. ..	8	8,000 0	8	8,000 0
512	Albert Consols .. ..	1	512 0	2½	1,280 0
1,024	Alfred Consols .. ..	8½	8,576 0	5	5,120 0
1,024	Ashburton United Mines .. ..	8½	8,576 0	10	10,240 0
1,624	Balleswidden .. ..	9	15,616 0	18	21,232 0
128	Balnoon Consols .. ..	25	3,200 0	25	3,200 0
10,000	Banwen Iron Company .. ..	6	60,000 0	6½	65,000 0
1,000	Barristown .. ..	5½	5,750 0	5	1,500 0
4,000	Bedford .. ..	2	8,000 0	5	20,000 0
1,244	Birch Tor Tin Mine .. ..	9	11,196 0	—	—
8,000	Blaenavon .. ..	50	400,000 0	17½	140,000 0
100	Botallack .. ..	182	18,200 0	60	6,000 0
120	Brewer .. ..	5	600 0	7	840 0
10,000	British Iron, New, regist. .. ..	12	120,000 0	7	70,000 0
—	Ditto ditto, scrip .. ..	10	—	10	—
128	Budnick Consols .. ..	52½	6,720 0	35	4,480 0
256	Butterdon .. ..	1	256 0	5	—
1,000	Callington .. ..	19	19,000 0	14	14,000 0
1,000	Camborne Consols .. ..	5	5,000 0	4	4,000 0
20,000	Cameron's Steam Coal .. ..	6	120,000 0	1	20,000 0
256	Caradon Mines .. ..	22½	5,800 0	10	2,560 0
256	Caradon United .. ..	24	6,144 0	5	1,280 0
256	Caradon Wheel Hooper .. ..	21	768 0	8	2,048 0
1,000	Carn Brea .. ..	15	15,000 0	100	100,000 0
3,000	Carthew Consols .. ..	1½	45,000 0	5	15,000 0
112	Charlestown .. ..	220	24,640 0	60	6,720 0
500	Comblawn .. ..	5¾	2,875 0	3	1,500 0
128	Comfort .. ..	45	5,760 0	35	4,480 0
256	Condurrow .. ..	20	5,120 0	130	9,116 0
2,560	Cook's Kitchen .. ..	14	35,840 0	8	5,120 0
1,000	Coombe Valley Quarry .. ..	3½	3,500 0	4½	4,500 0
6,500	Cornish Mining Company .. ..	2	13,000 0	2½ ½	16,250 0
20,000	Cornwall New Mining .. ..	1	20,000 0	1	20,000 0
1,000	Copper Bottom .. ..	1½	1,500 0	6½	6,500 0
212	Craddock Moor .. ..	23½	4,929 0	5	1,050 0
500	Cubert Mine .. ..	12½	6,250 0	—	—
1,000	Cwm Erfin .. ..	3	3,000 0	4	4,000 0
300	D. Prior and Buckfastleigh .. ..	16	4,800 0	16	4,800 0
7,100	Derwent .. ..	8½	60,350 0	5	35,500 0
845	Devon and Courtenay Consols .. ..	7¾	6,548 15	¾	635 15
1,024	Devon Great Consols .. ..	1	1,024 0	230	135,520 0
1,000	Dhurode .. ..	2	2,000 0	5	5,000 0
186	Dolcoath .. ..	30	5,580 0	15	2,790 0
2,560	Drake Walls .. ..	5	12,800 0	4	12,240 0
10,000	Durham County Coal .. ..	45	450,000 0	9	90,000 0
3,000	Dyfnwgwm .. ..	10	30,000 0	12½	37,500 0
2,500	East Birch Tor .. ..	3	7,500 0	3½	8,750 0
112	East Caradon .. ..	47	5,264 0	47	5,264 0
2,048	East Crowndale .. ..	6¾	13,056 0	2½	5,120 0
512	East Combe Silver-Lead.. ..	5½	3,328 0	6½	3,328 0
4,000	East Gunnis Lake, Sunden .. ..	½	2,000 0	¼	—
128	East Pool .. ..	15	1,920 0	60	3,840 0
9,000	East Tamar Consols .. ..	¾	6,750 0	1½	6,750 0
94	East Wheal Crofty .. ..	125	11,750 0	250	23,600 0
128	East Wheal Rose.. ..	50	6,400 0	600	76,800 0
—	East of Scotland Iron Company .. ..	5	—	1½	—
1,280	Esgair Lli .. ..	1½	1,920 0	5	6,400 0

Shares.	Company.	Paid.	Total Cost.	Price.	Market Value.
		£.	£. s.	£.	£. s.
256	Exmoor Wheal Eliza .. ..	6	1,536 0	9-10	2,560 0
512	Fowey Consols .. ..	40	20,480 0	45	23,040 0
1,024	Freidd Llwydd Mines .. ..	1½	1,280 0	3½	3,584 0
6,400	Gadair .. ..	2	2,800 0	2	12,800 0
4,000	General Mining Comp. for Ireland	1½	5,500 0	1½	6,000 0
256	Gonamena .. ..	44½	11,392 0	16	4,096 0
128	Goonvrea .. ..	4	503 0	2	256 0
100	Great Consols .. ..	1,000	100,000 0	250	25,000 0
512	Great Wheal Rough Tor Consols	18½	9,472 0	20	5,632 0
1,200	Growa Slate Company .. ..	5	6,000 0	5	6,000 0
6,000	Heignton Down Consols .. ..	½	3,000 0	1	6,000 0
512	Herodsfoot .. ..	27	6,912 0	15	6,144 0
10,000	Hibernian .. ..	12½	122,400 0	1½	13,750 0
1,000	Holmbush .. ..	22	22,000 0	1½	1,500 0
1,024	Kingsett and Bedford .. ..	½	512 0	¾	778 0
827	Kirkcudbrightshire .. ..	8½	7,029 10	5	1,654 0
2,048	Lamheroo Wheal Maria .. ..	13	26,624 0	2	4,096 0
252	Lanarth Consols .. ..	—	—	10	2,520 0
256	Lelant Consols .. ..	90	11,520 0	25	7,680 0
160	Levant .. ..	—	—	120	19,200 0
1,000	Lewis .. ..	16	16,000 0	8	8,000 0
1,000	Llwyn Malees .. ..	7½	7,500 0	7	7,000 0
3,600	Llynvi Iron .. ..	50	180,000 0	50	180,000 0
6,000	Marke Valley .. ..	10	60,000 0	1½	9,000 0
5,000	Mendip Hills .. ..	3	15,000 0	1½-½	7,500 0
5,000	Merionethshire Slate Company..	1½	7,500 0	2	10,000 0
128	Metha .. ..	34	4,352 0	140	17,920 0
20,000	Mining Company of Ireland	7	140,000 0	4	80,000 0
256	New East Crowndale .. ..	3¾	960 0	2½	740 0
128	North Fowey Consols .. ..	37	4,836 0	10	1,280 0
100	North Pool .. ..	45	4,500 0	500	16,500 0
140	North Roskear .. ..	5½	735 0	165	23,100 0
262	North Wheal Leisure .. ..	1½	393 0	2	524 0
15,000	Northern Coal Company..	23	345,000 0	2	30,000 0
128	Par Consols .. ..	55½	7,088 0	1,000	128,000 0
8,000	Pennant and Craigwen .. ..	2	16,000 0	2	16,000 0
100	Pennrhwi .. ..	30	3,000 0	65	6,500 0
1,024	Penzance Consols .. ..	16s. 3d.	832 0	2	2,048 0
512	Plymouth Wheal Yeoland .. ..	6½	3,136 0	10	5,120 0
200	Polsaith Consols .. ..	5½	1,100 0	4½	850 0
2,500	Rhoswiddol and Bachidon .. ..	10	25,000 0	10	25,000 0
10,000	Rhymney Iron .. ..	50	500,000 0	13	130,000 0
10,000	Ditto New .. ..	7	70,000 0	6½	68,750 0
1,000	Rosewall Hill .. ..	1	1,000 0	5	5,000 0
256	Rosewarva Mines .. ..	—	—	—	3,072 0
2,048	Runnaford Coombe Tin .. ..	¾	1,536 0	—	14,336 0
128	South Caradon .. ..	5	610 0	400	51,200 0
1,100	South Dolcoath .. ..	4	4,400 0	5	5,500 0
256	South Friendship Wheal Ann ..	20	5,120 0	4	1,024 0
256	South Molton .. ..	5	1,280 0	12½	3,200 0
9,000	South Tamar .. ..	1	9,000 0	3	—
256	South Tolgus .. ..	10	2,560 0	140	14,080 0
256	South Trelawny .. ..	28½	7,296 0	3	768 0
2,000	South Wales Mining Company	¾	1,500 0	1-1½	3,000 0
128	South Wheal Basset .. ..	110	14,080 0	150	19,200 0
124	South Wheal Frances .. ..	160	19,840 0	240	29,760 0
256	South Wheal Josiah .. ..	—	—	1½-2	512 0
1,000	South Wheal Maria .. ..	2½	2,750 0	1½	1,500 0
10,000	Southern and Western Irish ..	2	20,000 0	4	40,000 0
280	Spearne Moor .. ..	30	8,400 0	40	11,200 0
256	St. Austell Consols .. ..	9	2,304 0	—	—



Shares.	Company.	Paid.	Total Cost.	Price.	Market Value.
		£.	£. s.	£.	£. s.
94	St. Ives Consols .. ..	—	—	320	30,080 0
128	St. Michael Penkivel .. ..	5	640 0	10½	1,344 0
999	St. Minver Consols .. ..	1	999 0	6	5,994 0
1,000	Stray Park .. ..	43	43,000 0	26	26,000 0
9,600	Tamar Consols .. ..	3	28,800 0	8	60,000 0
1,024	Tavy Consols .. ..	4	4,096 0	4	4,096 0
6,000	Tincroft .. ..	7	42,000 0	6½	39,000 0
1,000	Tin Vale .. ..	2½	2,750 0	3½	3,500 0
58	Tokenbury .. ..	170	9,860 0	10	580 0
256	Tollpetherwin .. ..	3½	896 0	5	1,280 0
256	Tregordan .. ..	2	512 0	8	2,048 0
256	Trehane .. ..	1½	320 0	30	7,680 0
5,000	Treleigh Consols .. ..	6	30,000 0	1½	7,500 0
2,000	Trenance .. ..	3	6,000 0	—	—
96	Tresavean .. ..	10	960 0	150	14,400 0
120	Trethellan .. ..	5	600 0	16	1,920 0
120	Treviskey and Barrier .. ..	130	15,600 0	250	10,440 0
100	United Mines .. ..	300	30,000 0	350	35,000 0
256	Wellington Mines .. ..	25	6,400 0	20	5,120 0
256	West Caradon .. ..	20	5,120 0	130	33,480 0
512	West Fowey Consols .. ..	40	20,480 0	12	6,144 0
256	West Providence .. ..	9	2,304 0	15	3,840 0
200	West Seton .. ..	40	8,000 0	210	42,000 0
—	West of Scotland Iron Company	240	—	90	—
120	West Trethellan .. ..	5	500 0	30	3,600 0
256	West United Hills .. ..	—	—	4½	1,088 0
512	West Wheal Frances .. ..	1½	780 0	2	1,024 0
256	West Wheal Friendship .. ..	9	2,304 0	8	2,048 0
3,725	West Wheal Jewel .. ..	11	40,975 0	1½	4,656 0
256	West Wheal Tolgus .. ..	21½	5,440 0	6	1,536 0
256	West Wheal Treasury .. ..	19	4,864 0	10	2,560 0
1,024	Whiddon Mines .. ..	4½	4,864 0	3	3,072 0
5,200	Wicklow Copper .. ..	5	26,000 0	8	41,600 0
107	Wheal Adams .. ..	79	8,453 0	30	3,210 0
1,000	Wheal Agar .. ..	—	—	8	8,000 0
256	Wheal Albert .. ..	10	2,560 0	1	256 0
240	Wheal Anderton .. ..	23	5,520 0	15	3,600 0
128	Wheal Ann .. ..	—	—	50½	6,546 0
512	Wheal Anna Maria .. ..	6½	3,328 0	8	4,096 0
1,024	Wheal Ash .. ..	4½	4,608 0	8	8,192 0
120	Wheal Bal .. ..	5½	660 0	20	2,400 0
256	Wheal Benny .. ..	14½	3,712 0	2	512 0
256	Wheal Blencowe .. ..	21	5,376 0	5	1,280 0
256	Wheal Calstock .. ..	5	1,280 0	12	1,280 0
1,024	Wheal Coad .. ..	1	1,024 0	4	4,096 0
268	Wheal Courtenay .. ..	12½	3,350 0	15	4,020 0
256	Wheal Fortescue .. ..	6½	1,664 0	3	768 0
388	Wheal Franco .. ..	27	9,126 0	18	6,984 0
128	Wheal Harriet .. ..	45	5,760 0	—	—
100	Wheal Henry .. ..	—	—	31½	3,150 0
1,024	Wheal Lawrence .. ..	3	3,072 0	3	3,072 0
112	Wheal Margaret .. ..	79	8,848 0	200	28,000 0
512	Wheal Mary Ann .. ..	5	2,560 0	40	7,168 0
—	Wheal Penhale .. ..	—	—	12	—
210	Wheal Prospect .. ..	4	840 0	7	1,470 0
120	Wheal Reeth .. ..	41	4,920 0	150	18,000 0
99	Wheal Seton .. ..	214	22,286 0	720	61,280 0
512	Wheal Sophia .. ..	3½	1,718 0	5	2,560 0
128	Wheal Spearne .. ..	10	1,280 0	75	9,700 0
128	Wheal St. Ann .. ..	30	3,840 0	35	4,480 0
550	Wheal Trescoll .. ..	5	2,750 0	6½	2,575 0

Shares.	Company.	Paid.	Total Cost.	Price.	Market Value.
		£.	£. s.	£.	£. s.
260	Wheal Trelawny .. ..	7½	2,015 0	87	18,720 0
266	Wheal Tremaine (St. Ervan) ..	9½	2,432 0	2½	554 0
1,024	Wheal Tremayne .. ..	98½	9,600 0	3	3,072 0
92	Wheal Tryphena .. ..	140	12,880 0	265	24,380 0
512	Wheal Venton .. ..	1½	768 0	2	—
1,000	Wheal Vincent .. ..	1	1,375 0	6	6,000 0
256	Wheal Vlow (Perranz) .. ..	—	96 0	¾	96 0
184	Wheal Vyvyan .. ..	—	—	60	11,040 0
250	Wheal Williams .. ..	28½	7,093 15	8	2,000 0
1,024	William and Mary Worth ..	2	2,048 0	2½	2,562 0

## FOREIGN MINES.

5,000	Alten Mining Company .. ..	14½	62,500 0	1½	7,500 0
15,000	Asturian Mining Company ..	13	195,000 0	3½	58,135 0
20,000	Australian .. ..	3	60,000 0	5½-6½	130,000 0
10,000	Anglo-Mexican Company ..	100	1,000,000 0	¼	2,500 0
12,374	Ditto Subscription .. ..	25	309,350 0	1½	15,467 0
6,000	Barossa Range .. ..	18½	8,250 0	1½	9,000 0
3,000	Bolanos .. ..	150	450,000 0	3	9,000 0
2,000	Ditto Scrip .. ..	15	30,000 0	3½	7,500 0
10,000	Brazilian Imperial .. ..	23	230,000 0	7	70,000 0
12,000	Cobre Copper Company ..	40	430,000 0	13	156,000 0
10,000	Copapo Mining Company ..	14	140,000 0	3	30,000 0
10,000	General Mining Association ..	20	200,000 0	10	100,000 0
—	Guadalcanal .. ..	3½	—	5½	— 0
5,000	Kinzigthal Mining Association ..	2	10,000 0	3	15,000 0
20,051	Mexican Company .. ..	59	1,183,009 0	1	20,051 0
2,000	Mexican and South American ..	8	16,000 0	½	1,000 0
5,000	National Brazilian .. ..	30	150,000 0	3½	17,500 0
104,000	North British Australasian ..	1	104,000 0	¼	26,000 0
7,000	Royal Santiago .. ..	10	70,000 0	4	28,000 0
11,000	St. John del Rey .. ..	15	165,000 0	14½	155,275 0
13,174	United Mexican .. .. av.	28½	372,165 10	4½-3½	55,976 0

## LATEST PRICES of MATERIALS in CORNWALL and DEVON.

## CAST IRON.

[All Castings for an 8-inch Engine 2s. per cwt. above this List.]

Cylinders, Covers, Pistons, Piston Caps, Nozzles, Air Pumps and Covers, bored and turned .. .. .	25s.	per cwt.
Cylinder Cases .. .. .	19s.	"
Cylinder Bottoms, Condensers, and Bottoms .. .. .	8s. to 11s.	"
Steam and Eduction Pipes .. .. . from	8s. to 10s.	"
Feed Pipes .. .. . from	15s.	"
Hot Water Cisterns .. .. .	10s.	"
Beams, cast open .. .. .	14s.	"
Ditto, cast close .. .. .	9s.	"
Gudgeons, Troughs, Shafts, Bearings and Top Blocks, Sockets, and Saddles .. .. .	13s.	"
Ditto, fitted .. .. .	13s.	"
Hollow Stools for Beams .. .. .	12s.	"
Gudgeons and Shafts, turned .. .. .	11s.	"
Fly Wheels .. .. .	9s.	"
Segments and Arms .. .. .	11s.	"
Centre Pieces for Wheels, Capstans, &c. .. .. .	15s.	"
Ditto, bored .. .. .	10s.	"
Spur Wheels, 1 cwt. .. .. .	12s.	"
Ditto, under 1 cwt. .. .. .	12s.	"
Bevil ditto .. .. .	14s.	"
Ditto, under 1 cwt. .. .. .	16s. to 24s.	"
Extra if bored or turned .. .. .	10s.	"
Tooth Segments .. .. .	9s. 6d.	"
Cranks, not bored .. .. .	15s. to 21s.	"
Ditto, bored .. .. .	11s.	"
Manhole Branches and Doors .. .. .	16s.	"
Ditto, faced .. .. .	6s. 6d.	"
Fire-door Frames, Sleepers, and Fire Bars, cast open .. .. .	8s. 6d.	"
Ditto .. ditto .. ditto .. cast close .. .. .	7s. 6d.	"
Dampers and Frames, cast open .. .. .	8s. 6d.	"
Ditto .. ditto .. cast close .. .. .	7s.	"
Plain Pumps, 4 inch bore .. .. .	8s.	"
Short ditto .. .. .	13s.	"
Working Barrels, 5 inch .. .. .	16s.	"
Ditto, under .. .. .	12s.	"
Plunger, Knee, and H-Pieces, and Top Door Pieces, under 4 feet long .. .. .	6s. 6d.	"
Doors and Bottoms for ditto, cast open .. .. .	8s.	"
Ditto .. ditto, .. cast close .. .. .	10s.	"
Clack-seat Pieces and Doors .. .. .	22s.	"
Plunger Poles for Shaft-work, 6 inches and above .. .. .	24s.	"
Ditto, under 6 inches .. .. .	19s.	"
Stuffing Boxes and Glands .. .. .	9s.	"
Valves, Seats, and Clacks .. .. .	14s.	"
Ditto .. ditto, turned .. .. .	7s. 6d. each	"
Air Pipes, 4 inches diameter and 6 feet long .. .. .	16s.	"
Whim Shieves, 4 feet diameter .. .. .	14s.	"
Ditto, 3 feet 6 inches .. .. .	12s.	"
Ditto, 3 feet .. .. .	8s.	"
Ditto, 2 feet .. .. .	7s. 6d.	"
Ditto, 1 feet 6 inches .. .. .	8s. 6d. per cwt.	"
Capstan and Whim Shieves .. .. .	8s.	"
Flat Rope Shieves .. .. .	13s.	"
Tram Wheels .. .. .	6s. 6d.	"
Ditto, bored .. .. .		
Boiler Stands .. .. .		

## CAST IRON—continued.

Feedpole Cases, with Stuffing Boxes and Glands bored ..	}	24s.	per cwt.
Plunger Cases, with Stuffing Boxes, 6 inches .. ..			
Sweep Rods .. .. .		12s.	"
Ditto, turned .. .. .		20s.	"
Foundation Plates .. .. .		10s.	"
Mortice Wheels .. .. .		12s.	"
Kibble Moulds .. .. .		10s.	"
Anvil Blocks .. .. .		9s.	"
Hammers, Anvils, and Bits .. .. .		11s.	"
Earth Eyes .. .. .		10s.	"
Tram Saddles .. .. .		9s.	"
Stamp Heads .. .. .		6s. 6d.	"
Ditto, with long shanks .. .. .		8s.	"
Ditto Grounds .. .. .			
Stamp Tongues .. .. .		9s.	"
Cams for Stamp Axles .. .. .		7s. 6d.	"
Bucking Plates .. .. .		6s. 6d.	"
Dressing Plates and Backs for Grates, cast open .. ..		8s. 6d.	"
Ditto .. ditto .. cast close .. .. .		12s.	"
Crushing Rolls .. .. .		7s. 8d.	"
Ditto, cast in chills .. .. .		8s. 6d.	"
Mandrills .. .. .		14s.	"
Ditto, turned .. .. .		20s.	"
Pillars, not fluted .. .. .		10s.	"
Ditto, fluted .. .. .			
Furnaces, Green Sand .. .. .		10s.	"
Ditto, Loam .. .. .		12s.	"
Shaft Pulleys or Rollers .. .. .		8s.	"
Sampling Plates .. .. .		11s.	"
Open Top Water Pipes .. .. .		10s.	"
Iron Borings .. .. .		6s.	"
Ditto, fine .. .. .		7s.	"
Angular Bars .. .. .		12s.	"
Frames for Crushers .. .. .		10s.	"
Block Tin and Ingot Moulds .. .. .		13s.	"
Barrow Wheels .. .. .		11s.	"
Wheel and Pipe Boxes .. .. .		16s.	"
Pall Plates .. .. .		14s.	"
Grate Castings, Iron .. .. .		14s. to 16s.	"
Shoes for Drags .. .. .		9s.	"
Hawser Pipes .. .. .		20s.	"
Plough Chips .. .. .		10s.	"
Grate Plate for Stamps, open .. .. .		8s. 6d.	"
Ditto ditto close .. .. .		12s.	"
Stamp Guides .. .. .		11s.	"
Chain Guides .. .. .		8s.	"
Weights, adjusted $\frac{1}{2}$ cwt. .. .. .		6s. 6d. each	
Ditto, 14 lb. .. .. .		2s.	"
Ditto, 7 lb. .. .. .		1s. 4d.	"
Ditto, 4 lb. .. .. .		10d.	"
Ditto, 2 lb. .. .. .		8d.	"
Ditto, 1 lb. .. .. .		5d.	"
Ditto, $\frac{1}{2}$ lb. .. .. .		4d.	"
Single Valve Boxes—			
4 inch .. .. .		£4. 10s.	
3½ inch .. .. .		£3. 15s.	
3 inch .. .. .		£3. 3s.	
2½ inch .. .. .		£3. 0s.	
2 inch .. .. .		£2. 10s.	
Boring Working Barrels .. .. .		5s. per inch	
Turning Plunger Poles .. .. .		7s.	"



## WROUGHT IRON.

Plain Cylindrical Boilers, made of Best Plates and Best Rivet Iron	16s.	per cwt.
Whim Kibbles, hammered Iron .. .. .	16s.	"
Ditto, rolled .. .. .	14s.	"
Winze Kibbles .. .. .	7s. 6d.	each
Tapered Rod Plates, hammered from Scraps, 6 inches wide } and under, in Slabs .. .. .	12s.	per cwt.
Ditto, 7 inches .. .. .	13s.	"
Ditto, 8 inches .. .. .	14s.	"
Ditto, 6 inches .. .. .	15s.	"
Ditto, with square holes .. .. .	16s.	"
Ditto, 7 inches wide holes .. .. .	16s.	"
Ditto, square holes .. .. .	17s.	"
Ditto, 8 inches wide holes .. .. .	17s.	"
Ditto, square holes .. .. .	18s.	"
Miners' Shovels .. .. .	26s.	"
Ditto, steel point .. .. .	46s.	"
Flat Thread Tops .. .. .	4d.	per lb.
Valve Iron .. .. .	14s.	per cwt.
Fagoted Iron, single .. .. .	10s.	"
Ditto, double .. .. .	12s.	"
Piston and Air Pump Rods .. .. .	7d. to 1s.	per lb.
Kibble Plates, hammered .. .. .	13s.	per cwt.
Ditto, rolled .. .. .	11s.	"
Axle Arms and Shear Moulds .. .. .	12s.	"
Grate Plates, Rough .. .. .	14s.	"
Ditto, Middle-cut .. .. .	20s.	"
Ditto, Finished .. .. .	25s.	"
Furnace Bottoms .. .. .	20s.	"
Piston Rings, turned .. .. .	9d. to 1s.	per lb.
Loops .. .. .	5d. to 8d.	"
Outer Connection Caps. .. .. .	21s.	per cwt.
Best Boiler Plates (Shropshire) .. .. .	12s.	"
Bar Iron .. .. .	18s.	"
Ditto, best .. .. .	10s.	"
Hoop Iron .. .. .		
Sheet Iron .. .. .	12s.	"
Nail Rods .. .. .		
Vices .. .. .	6d.	per lb.
Anvils .. .. .	32s.	per cwt.
Best Proved Short-link Chain, 3-8 inch .. .. .	27s.	"
Ditto .. ditto 7-16 inch .. .. .	25s.	"
Ditto .. ditto $\frac{1}{2}$ inch .. .. .	25s.	"
Ditto .. ditto 9-16 inch .. .. .	24s.	"
Ditto .. ditto 5-8 inch .. .. .	22s.	"
Ditto .. ditto 11-16 inch .. .. .	22s.	"
Ditto .. ditto $\frac{3}{4}$ inch .. .. .	} 21s.	"
Ditto .. ditto 1 inch .. .. .		

## STEEL.

Gad Steel .. .. .	27s.	"
Best (L) Blister .. .. .	38s. to 40s.	"

## BRASS.

Best Composition Metal Plunger Poles, & Linings for Air Pumps	1s. 6d.	per lb.
Covers, Buckets, &c. bored and turned .. .. .	1s. 5d.	"
Bearing and Bucket Brasses .. .. .	11d.	"
Ditto .. ditto, bored .. .. .	1s. 2d.	"
Working Barrels, bored .. .. .	1s. 5d.	"
Brass Bushings, large .. .. .	2s.	"
Ditto small .. .. .		
Steam Valves and Seats .. .. .	2s. 2d.	"
Ditto, double beat .. .. .	2s. 4d.	"
Brasses for Parallel Motion .. .. .	20d. to 22d.	"
Ditto for Outer Connection .. .. .	1s. to 1s. 3d.	"
Ditto Main Coops .. .. .	1s. to 1s. 3d.	"

TABLE OF THE RESPECTIVE WEIGHTS OF BODIES.

Names of Bodies.	Weight of a cubic foot.		Weight of a cubic inch.	Number of cubic inches in a pound.
	Ounces.	Pounds.		
METALS.				
			Oz.	
Zinc, cast .. ..	7,190	440'37	4'160	3'84
Iron, cast .. ..	7,207	450'43	4'228	3'83
Tin, cast .. ..	7,291	455'68	4'219	3'79
Iron, bar .. ..	7,788	486'75	4'506	3'55
Steel, hard .. ..	7,816	488'50	4'523	3'53
Steel, soft .. ..	7,833	489'56	4'532	3'52
Brass, cast .. ..	8,395	524'68	4'858	3'29
Copper, cast .. ..	8,788	549'25	5'085	3'14
Silver, pure, cast .. ..	10,474	654'62	6'061	2'63
Silver, pure, hammered .. ..	10,510	656'87	6'082	2'63
Lead, cast .. ..	11,352	709'50	6'569	2'43
Gold, trinket .. ..	15,709	981'81	9'090	1'75
Gold, coin .. ..	17,647	1,102'93	10'212	1'56
Gold, pure, cast .. ..	19,258	1,203'62	11'133	1'43
Gold, hammered .. ..	19,361	1,210'06	11'204	1'42
Platinum, pure .. ..	19,500	1,218'75	11'284	1'41
Platinum, hammered .. ..	20,336	1,271'00	11'768	1'35
STONES, EARTHS, &c.				
Coal .. ..	1,250	78'12	0'723	22'11
Sand .. ..	1,520	95'00	0'879	18'18
Earth, common .. ..	1,984	124'00	1'148	13'93
Brick .. ..	2,000	125'00	1'157	13'82
Sulphur .. ..	2,033	127'06	1'176	13'59
Clay or Loam .. ..	2,160	135'00	1'250	12'80
Stone, paving .. ..	2,416	151'00	1'398	11'44
Stone, common .. ..	2,520	157'50	1'458	10'97
Flint and Spar .. ..	2,594	162'12	1'501	10'67
Granite, red Egyptian .. ..	2,654	165'87	1'535	10'41
Glass, green .. ..	2,642	165'12	1'528	10'46
Glass, white .. ..	2,892	180'75	1'673	9'56
Glass, bottle .. ..	2,733	170'81	1'581	10'11
Slate .. ..	2,672	167'00	1'546	10'34
Marble .. ..	2,742	171'37	1'586	10'83
White Lead .. ..	3,160	197'50	1'828	8'74
Limestone .. ..	3,171	198'68	1'839	8'69
RESINS, GUMS, &c.				
Gunpowder, solid .. ..	1,745	109'06	1'009	15'84
Gunpowder, loose h. p. ..	836	52'25	0'483	33'07
Gunpowder, cls. shk. ..	937	58'56	0'542	29'50
Wax .. ..	897	56'06	0'519	30'82
Wax, bees' .. ..	965	60'31	0'558	28'65
Tallow .. ..	945	59'06	0'546	29'25
Camphor .. ..	989	61'81	0'572	27'95
Honey .. ..	1,456	91'00	0'842	18'98
Bone, ox .. ..	1,659	103'68	0'960	16'66
Ivory .. ..	1,822	113'87	1'054	15'17

## TABLE OF THE RESPECTIVE WEIGHTS OF BODIES—

*Continued.*

Names of Bodies.	Weight of a cubic foot.		Weight of a cubic inch.	Number of cubic inches in a pound.
	Ounces.	Pounds.		
WOODS.				
Cork .. .. .	240	15·00	0·138	115·20
Poplar .. .. .	383	23·93	0·221	72·18
Larch .. .. .	544	34·00	0·314	50·82
Elm and New England Fir..	556	34·75	0·321	49·72
Mahogany, Honduras ..	560	35·00	0·324	49·37
Willow.. .. .	585	36·56	0·338	47·26
Cedar .. .. .	596	37·25	0·344	46·38
Pine, pitch .. .. .	660	41·25	0·381	41·89
Pear-tree .. .. .	661	41·31	0·382	41·82
Walnut .. .. .	671	41·93	0·388	41·20
Mar Forest Fir .. .. .	694	43·37	0·401	39·83
Beech .. .. .	696	43·50	0·402	39·72
Cherry-tree .. .. .	715	44·68	0·413	38·65
Teak .. .. .	745	46·56	0·431	37·11
Maple and Riga Fir .. ..	750	46·87	0·434	36·86
Ash and Dar Oak .. .. .	760	47·50	0·439	36·37
Yew, Dutch .. .. .	788	49·25	0·456	35·08
Apple-tree .. .. .	793	49·56	0·458	34·86
Alder .. .. .	800	50·00	0·463	34·56
Yew, Spanish.. .. .	807	50·43	0·467	34·26
Mahogany, Spanish .. ..	852	53·25	0·493	32·45
Oak, Canadian .. .. .	872	54·50	0·504	31·70
Box, French .. .. .	912	57·00	0·527	30·31
Logwood .. .. .	913	57·06	0·528	30·28
Oak, English .. .. .	970	60·62	0·561	28·50
Oak, ditto sixty years old	1,170	73·12	0·677	23·63
Ebony .. .. .	1,331	83·18	0·770	20·77
Lignum Vitæ .. .. .	1,333	83·31	0·771	20·74
FLUIDS.				
Air at earth's surface, about	1·0286	·06428	·000595	26,881·97
Ether, sulphuric .. .. .	716	44·75	0·414	38·61
Alcohol, absolute .. .. .	792	49·50	0·458	34·93
Bitumen, liquid .. .. .	848	53·00	0·490	32·60
Oil of Turpentine .. .. .	870	54·37	0·503	31·77
Ether, muriatic .. .. .	874	54·62	0·505	31·63
Oil, olive .. .. .	915	57·18	0·529	30·21
Brandy.. .. .	927	57·93	0·536	29·82
Oil, linseed .. .. .	932	58·25	0·539	29·66
Wine, Burgundy .. .. .	991	61·93	0·573	27·89
Wine, Bourdeaux .. .. .	994	62·12	0·575	27·81
Water, distilled .. .. .	1,000	62·50	0·578	27·64
Tar .. .. .	1,015	63·43	0·587	27·23
Vinegar .. .. .	1,026	64·12	0·593	26·94
Water, sea .. .. .	1,028	64·25	0·594	26·89
Milk .. .. .	1,030	64·37	0·596	26·84
Beer .. .. .	1,034	64·62	0·598	26·73
Acid, nitric .. .. .	1,218	76·12	0·704	22·69
Water, Dead Sea .. .. .	1,240	77·50	0·717	22·29
Acid, nitrous .. .. .	1,550	96·87	0·897	17·83
Acid, sulphuric .. .. .	1,841	115·06	1·065	15·01
Mercury .. .. .	13,568	848·00	7·851	2·03

TABLE OF THE CHEMICAL ELEMENTS.

Name of Element.	Name of Discoverer.	Date.	Symbol.	Equiva- lent numbers.	Specific Gravity.
Oxygen .. ..	{ Priestly, 1774 Scheele, 1775 }	1774-5	O.	8	1·102
Hydrogen .. ..	Cavendish.	1766	H.	1	0·069
Nitrogen .. ..	Rutherford.	1772	N.	14	0·972
Chlorine .. ..	Scheele.	1774	Cl.	36	2·47
Sulphur .. ..	Known to ancients.	..	S.	16	1·99
Selenium .. ..	Berzelius.	1818	Se.	40	4·32
Boron .. ..	Davy.	1807	B.	10	2·0
Phosphorus ..	Brandt.	1669	P.	16	1·77
Wood					
Charcoal } .. ..	.. ..	..	..	..	0·441
Diamond }					
Carbon .. ..	Known to ancients.	..	C.	6	3·520
Iodine .. ..	Courtois.	1812	I.	126	3·084
Bromine .. ..	Balard.	1826	Br.	78	3·0
Fluorine .. ..	.. ..	..	F.	18	..
Potassium ..	Davy.	1807	K.	40	0·865
Sodium .. ..	Davy.	1807	Na.	24	0·972
Lithium .. ..	Davy.	1818	L.	10	..
Calcium .. ..	Davy.	1807	Ca.	20	..
Barium .. ..	Davy.	1807	Ba.	69	2·
Strontium ..	Davy.	1807	Sn.	44	2·?
Magnesium ..	Bussy.	1830	Mg.	12	..
Aluminium ..	Wohler.	1828	Al.	13	..
Silicum .. ..	Berzelius.	1824	Si.	24	..
Glucinum .. ..	Wohler.	1828	G.	18	..
Ittrium .. ..	Wohler.	1828	Y.	32	..
Zirconium ..	Berzelius.	1824	Zr.	30?	..
Thorium .. ..	Berzelius.	1829	Th.	60	..
Iron .. ..	Known to ancients.	..	Fe.	28	7·7
Lead .. ..	Known to ancients.	..	Pb.	104	11·38
Copper .. ..	Known to ancients.	..	Cu.	32	8·66
Zinc .. ..	Known in 16th century.	..	Z.	32	7·
Antimony ..	Known about 1490.	1490	Sb.	65	6·7
Tin .. ..	Known to ancients.	..	Sn.	58	7·28
Bismuth .. ..	Known to Agricola.	1530	Bi.	72	9·8
Manganese ..	Gahn and Scheele.	1774	Mn.	28	8·013
Chromium .. ..	Vauquelin.	1797	Cr.	28	5·9
Cobalt .. ..	Brandt.	1733	Co.	30	7·834
Arsenic .. ..	Brandt.	1733	As.	38	5·7
Nickel .. ..	Cronstedt.	1751	Ni.	28	8·5
Vanadium ..	Sefstrom.	1830	V.	68	..
Cadmium .. ..	Stromeyer.	1817	Cd.	56	8·60
Tungsten ..	D'Elhuyart.	1781	W.	100	17·4
Molybdenum ..	Hjelm.	1782	Mo.	48	8·6
Cerium .. ..	Berzelius and Hisinger.	1803	Ce.	48	..
Columbium ..	Hatchett.	1801	Ta.	185	6·0
Tellurium ..	Müller.	1782	Te.	64	6·25
Titanium .. ..	Gregor.	1791	Ti.	24	5·3
Uranium .. ..	Klaproth.	1789	U.	217	9·0
Mercury .. ..	Known to ancients.	..	Hg.	200	13·5
Silver .. ..	Known to ancients.	..	Ag.	108	10·5
Gold .. ..	Known to ancients.	..	Au.	200	19·3
Platinum .. ..	Wood, Jamaica.	1741	Pl.	96	21·2
Paladium ..	Wollaston.	1803	Pd.	54	11·3
Rhodium .. ..	Wollaston.	1803	R.	52	11·0
Osmium .. ..	Tennant.	1803	Os.	100	10·0
Iridium .. ..	Tennant and Descotils.	1803	Ir.	96	15·8



## STONE QUARRIES.

Quarry, and where situate.	Colour.	Weight per cubic foot.
NATURE OR COMPONENT PARTS.		
<i>Sandstone, chiefly quartz and silex.</i>		lbs.
Abercarne, Newport, Monmouthshire .. ..	Dark bluish grey	168
Aislaby, Whitby, Yorkshire .. ..	Light brown	126½
Binnie, Uphall, Linlithgowshire .. ..	Brownish grey	140
Bramley Fall, Leeds, Yorkshire .. ..	Light brown	142½
Craigleith, Bed Rock, near Edinburgh ..	Whitish grey	146
Darley Dale, Bakewell, Derbyshire .. ..	Light brown	148½
Duke's Quarries, Cromford, Derbyshire ..	Purplish green varieg.	144½
Giffneuch, Glasgow, Lanarkshire .. ..	Pale grey	144
Glamis, Forfar, Forfarshire .. ..	Purple grey	161
Heddon, Newcastle-on-Tyne .. ..	Light brown	130½
Hollington, Uttoxeter .. ..	Brownish grey	133
Longannet, Perthshire .. ..	Light brown	131½
Munlochy, Ross-shire .. ..	Red and variegated	160½
Mylnefield, Dundee .. ..	Purplish grey	160
Park Spring, Leeds .. ..	Light brown	131
Rock Valley, Mansfield, Nottinghamshire ..	Brick-red	148½
Scotgate Head, Huddersfield .. ..	Greenish grey	158
<i>Limestone, chiefly carbonate of lime.</i>		
Ancaster, Sleaford, Lincolnshire .. ..	Cream-colour	139½
Barnack Mill, Stamford .. ..	Whitish brown	136½
Box Hill, Chippenham, Wiltshire .. ..	Cream	123
Chilmark, Salisbury .. ..	Greenish brown	153½
Doultong, Shepton Mallet .. ..	Light brown	134½
Ham Hill, Yeovil, Somersetshire .. ..	Deep ferr. brown	141½
Hopton Wood, Worksworth, Derbyshire ..	Light grey	158½
Ketton, Stamford, Rutlandshire .. ..	Dark cream	128½
Portland (Grove Quarry), Weymouth .. ..	Whitish brown	147½
Portland (Waycroft Quarry), Weymouth ..	Ditto	135½
Purbeck, Corfe Castle, Dorset .. ..	Light brown	151
Sutton, Bridgend, Glamorganshire .. ..	Light cream	136
Taynton, Burford, Oxfordshire .. ..	Streaky brown	136
<i>Magnesian Limestone, chiefly carbonates of lime and magnesia.</i>		
Bolsover, Chesterfield .. ..	Yellowish brown	151½
Brodsworth, Doncaster .. ..	Light brown	133½
Huddlestone, Sherburne, Yorkshire .. ..	Whitish cream	137½
Mansfield-Woodhouse, Mansfield .. ..	Yellowish brown	145½
North Auston, Rotherham .. ..	Ditto	144
Roche Abbey, Bawtry, Yorkshire .. ..	Whitish cream	139
Smawse Hall, Tadcaster, Yorkshire .. ..	Light yellowish brown	127½

24 cubic feet of sand, 17 ditto clay, 18 ditto earth, 13 ditto chalk, equal to 1 ton.

1 cubic yard of earth before digging will occupy about 1½ cubic yards when dug, and contains 21 striked bushels, which is considered a *single load*, and double these quantities a *double load*.

## PART V.

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**Directory.**


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## PRESENT ROYAL FAMILY.

QUEEN VICTORIA, *b.* May 24, 1819; *suc.* June 20, 1837; *cr.* June 28, 1838;  
*m.* Feb. 10, 1840, to

FRANCIS ALBERT AUGUSTUS CHARLES EMANUEL, Duke of Saxe, Prince  
of Coburg and Gotha, *b.* August 26, 1819.

## Issue.

VICTORIA ADELAIDE MARY LOUISA, Princess Royal, *b.* Nov. 21, 1840.

ALBERT EDWARD, Prince of Wales, *b.* Nov. 9, 1841.

ALICE MAUD MARY, *b.* April 15, 1843.

ALFRED ERNEST ALBERT, *b.* Aug. 6, 1844.      HELENA AUGUSTA, *b.* May 25, 1846.

LOUISA CAROLINE ALBERTA, *b.* March 18, 1848.

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King of Hanover.....	<i>born</i> June 5, 1771
Duke of Cambridge.....	Feb. 24, 1774
Duchess of Gloucester .....	April 25, 1776
Duchess of Kent .....	Aug. 17, 1786
Duchess of Cambridge .....	July 25, 1795
Crown Prince of Hanover.....	May 27, 1817
Prince George of Cambridge .....	Mar. 26, 1819
Princess Augusta of Cambridge .....	July 19, 1822
Princess Mary of Cambridge .....	Nov. 27, 1833

# MEMBERS OF THE HOUSE OF PEERS.

## PEERS OF THE BLOOD ROYAL.

- 1799 Ernest Augustus, Duke of Cumberland and Teviotdale, K.G., G.C.B., G.C.H., King of Hanover  
1801 Adolphus Frederick, Duke of Cambridge, K.G., G.C.B., G.C.H., Cambridge-house, 94, Piccadilly, and Kew

## ARCHBISHOPS.

- Canterbury.—John Bird Sumner, 1848. Lambeth-palace  
York.—Thomas Musgrave, D.D., b. 1788, consecrated Bishop of Hereford, 1837, translated to York 1847. 41, Belgrave-square

## DUKES.

- 1682 Beaufort, K.G., 22, Arlington-st.  
1694 Bedford, K.G., 6, Belgrave-square  
1711 Brandon, K.G., 12, Portman-sq.  
1822 Buckingham, K.G., 6, Wilton-st.  
1833 Cleveland, K.G., 17, St. James's-sq.  
1694 Devonshire, K.G., 78, Piccadilly  
1675 Grafton, 47, Clarges-street  
1694 Leeds  
1719 Manchester, Clarendon-hotel  
1702 Marlborough, 44, Brook-street  
1756 Newcastle, K.G., 17, Portman-sq.  
1483 Norfolk, 21, St. James's-square  
1766 Northumberland, Charing-cross  
1716 Portland, 19, Cavendish-square  
1675 Richmond, K.G., 51, Portland-pl.  
1703 Rutland, K.G., 94, Pall Mall  
1546 Somerset, Park-lane  
1833 Sutherland, K.G., Stafford-house  
1814 Wellington, K.G., G.C.B. Apsley-ho.

## MARQUISES.

- 1790 Abercorn, K.G., South Audley-st.  
1821 Ailesbury, K.T., 41, Grosvenor-sq.  
1831 Ailsa, 57, St. James's-street  
1815 Anglesea, K.G., 1, Old Burling.-st.  
1831 Breadalbane, K.T., 21, Park-lane  
1826 Bristol, 6, St. James's-square  
1812 Camden, K.G., 9, Belgrave-square  
1815 Cholmondeley, 12, Carlton-house-terrace  
1849 Dalhousie  
1801 Exeter, K.G., 36, Grosvenor-sq.  
1793 Hertford, K.G., 13, Berkeley-sq.  
1784 Lansdowne, K.G., 54, Berkeley-sq.  
1838 Normanby, Reform-club  
1812 Northampton, 145, Piccadilly  
1789 Salisbury, K.G., 20, Arlington-st.  
1786 Townsend  
1837 Westminster, 33, Up. Grosvenor-st.  
1551 Winchester, 158, New Bond-st.

## EARLS.

- 1784 Abergavenny, 58, Portland-place

- 1682 Abingdon, 7, Albermarle-street  
1696 Albemarle  
1826 Amherst, G.C.H., 66, Grosvenor-st.  
1730 Ashburnham, 30, Up. Grosvenor-st.  
1714 Aylesford  
1772 Bathurst, 4, Wilton-crescent  
1815 Beauchamp, 37, Portman-square  
1790 Beverley, 8, Portman-square  
1815 Bradford, 43, Belgrave-square  
1815 Brownlow, 12, Belgrave-square  
1746 Buckinghamshire  
1831 Burlington, 10, Belgrave-square  
1800 Cadogan, 138, Piccadilly  
1831 Camperdown, 15, Hill-street  
1661 Cardigan, 36, Portman-square  
1661 Carlisle, 12, Grosvenor-place  
1793 Carnarvon, 43, Grosvenor-square  
1814 Cathcart, K.C.B., Carlton-club  
1827 Cawdor, 74, South Audley-street  
1628 Chesterfield, 25, Hill-street  
1801 Chichester, 22, Grosvenor-place  
1776 Clarendon, G.C.B., 1, Grosv.-cres.  
1753 Cornwallis, 6, Hill-street  
1718 Cowper, 1, Great Stanhope-street  
1801 Craven, 16, Charles-street  
1711 Dartmouth, 23, St. James's-square  
1816 De Grey, K.G., 4, St. James's-sq.  
1761 De la Warr, 17, Up. Grosvenor-st.  
1622 Denbigh, 49, Eaton-square  
1485 Derby, 23, Grosvenor-square  
1553 Devon  
1790 Digby, 35, Brook-street  
1837 Ducie, 24, Belgrave-square  
1831 Durham  
1837 Effingham, 57, Eaton-place  
1821 Eldon, 1, Hamilton-place  
1844 Ellenborough, 113, Eaton-crescent  
1846 Ellesmere, 18, Belgrave-square  
1661 Essex  
1821 Falmouth, 2, St. James's-square  
1711 Ferrers  
1841 Fitzhardinge, Spring-gardens  
1716 Fitzwilliam, Halkin-street  
1789 Fortescue, 17, Grosvenor-square  
1841 Gainsborough, 9, Cavendish-sq.  
1833 Granville, 16, Bruton-street  
1802 Grey, 13, Carlton-house-terrace  
1752 Guildford, 23, Dover-st., Piccadilly  
1719 Harbrough, Steven's-hotel  
1754 Hardwicke, Carlton-club  
1812 Harewood, 13, Hanover-square  
1742 Harrington, Whitehall-gardens  
1809 Harrowby, 39, Grosvenor-square  
1821 Howe, G.C.H., Curzon-house  
1529 Huntingdon, Union-club  
1756 Ilchester, 31, Old Burlington-st.  
1697 Jersey, 38, Berkeley-square  
1837 Leicester  
1831 Lichfield  
1626 Lindsey

1796 Liverpool, G.C.B., Mid. Scot.-yard  
 1807 Lonsdale, 14 & 15, Carl.-ho.-terr.  
 1838 Lovelace, 19, Gt. Cumberland-st.  
 1721 Macclesfield, 9, Conduit-street  
 1800 Malmsbury, 8, Whitehall-gardens  
 1792 Mansfield, K. T., Carlton-club  
 1806 Manvers, 13, Portman-square  
 1813 Minto, G.C.B., 48, Eaton-square  
 1815 Morley, Kent-ho., Knightsbridge  
 1789 Mt. Edgecombe  
 1831 Munster, Windsor-barracks  
 1805 Nelson, Carlton-club  
 1801 Onslow, Clarendon-hotel  
 1806 Orford, White's-club  
 1711 Oxford  
 1551 Pembroke, 7, Carlton-house-terr.  
 1721 Pomfret, 62a, Grosvenor-street  
 1743 Portsmouth  
 1706 Poulett, 9, Gt. Stanhope-street  
 1804 Powis, 45, Berkeley-square  
 1765 Radnor, 52, Grosvenor-street  
 1833 Ripon, 1, Carlton-gardens  
 1801 Romney, 7, Grosvenor-street  
 1801 Rosslyn  
 1815 St. Germans, 36, Dover-street  
 1660 Sandwich  
 1690 Scarborough, 41, South-street  
 1672 Shaftesbury, 24, Grosvenor-sq.  
 1442 Shrewsbury, Mivart's-hotel  
 1821 Somers, 45, Grosvenor-place  
 1765 Spencer, Spencer-house  
 1628 Stamford, 33, Hill-st., Berkeley-sq.  
 1718 Stanhope, 26, Dover-street  
 1821 Stradbroke, 18, Queen-street  
 1847 Strafford, G.C.B., G.C.H., 44, Gros-  
 venor-street  
 1603 Suffolk, 9, Clarges-street  
 1784 Talbot, Carlton-club  
 1714 Tankerville, 23, Hertford-street  
 1815 Verulam, 40, Grosvenor-square  
 1685 Waldegrave, 4, Harley-street  
 1746 Warwick, K. T., 7, Carlton-gardns.  
 1624 Westmorland, G.C.B., 12, Upper  
 Harley-street  
 1801 Wilton, 7, Grosvenor-square  
 1628 Winchelsea, 2 & 3, Old Palace-yd.  
 1837 Yarborough, 17, Arlington-street  
 1838 Zetland, 19, Arlington-street

## VISCOUNTS.

1823 Beresford, G.C.B. 16, Cavendish-sq.  
 1712 Bolingbroke, 35, Mortimer-street  
 1828 Canning, 10, Grosvenor-square  
 1835 Canterbury, 4, Bolton-row  
 1826 Combermere, G.C.B., G.C.H., 48,  
 Belgrave-square  
 1816 Exmouth, Carlton-club  
 1849 Gough  
 1846 Hardinge, G.C.B., 15, Stanhope-st.  
 1550 Hereford  
 1842 Hill, Carlton-club  
 1766 Maynard, 38, Grosvenor-square  
 1802 Melville, K.T., 3, Somerset-place  
 1839 Ponsonby, G.C.H.  
 1801 St. Vincent, Grosvenor-hotel  
 1805 Sidmouth, 78, Cadogan-place

1789 Sydney, 3, Cleveland-square  
 1721 Torrington

## BISHOPS.

*Cons.*

Rt. Hn. Dr. C. J. Blomfield London... 1824  
 Dr. E. Maltby ..... Durham .. 1831  
 Dr. C. R. Sumner..... Winchester 1826  
 Dr. J. Kaye..... Lincoln .. 1820  
 Dr. C. Bethell ..... Bangor... 1824  
 Hon. Dr. H. Percy .... Carlisle... 1827  
 Dr. G. Murray ..... Rochester.. 1813  
 Hon. Dr. R. Bagot .... Bth. & Wells 1829  
 Dr. J. H. Monk..... Glos. & Bris. 1830  
 Dr. H. Phillpotts ..... Exeter .... 1830  
 Dr. C. H. Longley .... Ripon .... 1836  
 Dr. E. Denison ..... Salisbury.. 1837  
 Dr. G. Davys ..... Peterboro. 1839  
 Dr. C. Thirlwall..... St. David's 1840  
 Dr. H. Pepys ..... Worcester 1840  
 Dr. A. T. Gilbert ..... Chichester 1842  
 Dr. J. Lonsdale..... Lichfield .. 1843  
 Dr. T. Turton ..... Ely ..... 1845  
 Dr. S. Wilberforce .... Oxfod .... 1845  
 Dr. T. V. Short ..... St. Asaph.. 1841  
 Dr. J. P. Lee ..... Manchester 1847  
 Dr. Hampden..... Hereford.. 1847  
 Dr. J. Graham ..... Chester .. 1848  
 Dr. S. Hinds ..... Norwich .. 1849  
 Dr. A. Olivant ..... Llandaff .. 1849

## BARONS.

1801 Abercromby  
 1835 Abinger, 4, New-street  
 1801 Alvanley  
 1605 Arundell, Union-club  
 1835 Ashburton, 82, Piccadilly  
 1794 Auckland, Bp. of Sodor and Man,  
 Kensington-gore  
 1297 Audley  
 1780 Bagot, Carlton-club  
 1837 Bateman, 52, South-street  
 1797 Bayning, University-club  
 1433 Beaumont, 18, Curzon-street  
 1455 Berners  
 1784 Berwick, 1, Stable-yard  
 1823 Bexley, 31, Great George-street  
 1797 Bolton, Thomas's-hotel  
 1761 Boston, United Service-club  
 1783 Braybrooke, 10, New Burlington-st.  
 1830 Brougham, 4, Grafton-street  
 1643 Byron, 21, Eaton-place  
 1796 Calthorpe, 33, Grosvenor-square  
 1841 Campbell, South-place  
 1344 Camoys, 12, Dorset-square  
 1834 Carew  
 1796 Carrington, Whitehall-yard  
 1784 Carteret  
 1815 Churchill, 2, Upper Wimpole-street  
 1672 Clifford, Ford's-hotel, Man.-square  
 1299 Clinton  
 1789 Cloncurry, 60, St. James's-square  
 1839 Colborne, 19, Hill-street  
 1817 Colchester, 76, South Audley-st.  
 1841 Congleton  
 1836 Cottenham, 15, Park-lane



1828 Cowley  
 1806 Crewe, 2, Hill-street  
 1307 Dacre, 2, Chesterfield-street  
 1839 De Freyne, 45, Oxford-terrace  
 1821 Delamere, 33, Upper Brook-street  
 1835 De Lisle, 16, New-Burlington-st.  
 1838 De Mauley, 21, St. James's-place  
 1834 Denman, 38, Portland-place  
 1264 De Ros  
 1831 De Saumarez, University-club  
 1826 De Tabley, Mivart's-hotel  
 1831 Dinorben, 75, South Audley-street  
 1786 Dorchester, Christie's-hotel  
 1615 Dormer  
 1790 Douglas  
 1839 Dunfermline  
 1780 Dyncvor, 34, Dover-street  
 1806 Erskine  
 1826 Feversham, 25, Belgrave-square  
 1776 Foley, 26, Grosvenor-square  
 1821 Forester, 21, Charles-street  
 1800 Gardner, 46, Dover-street  
 1824 Gifford  
 1835 Glenelg, H., 4, Albany  
 1832 Godolphin  
 1782 Grantley, Carlton-club  
 1289 Hasting, 5, Southwick-place  
 1815 Harris, 30, Albermarle-street  
 1835 Hatherton, 4, Halkin-terrace  
 1776 Hawke  
 1828 Heytesbury, G.C.B.  
 1792 Holland, Kensington  
 1597 Howard de Walden  
 1831 Howden, 13, Hereford-street  
 1839 Keane, United Service-club  
 1788 Kenyon, 9, Portman-square  
 1836 Langdale, Roehampton  
 1839 Leigh, 30, Portman-square  
 1797 Lilford, 10, Grosvenor-place  
 1850 Londesborough  
 1837 Lovat, Brooks's-club  
 1827 Lyndhurst  
 1794 Lyttleton, 38, St. James's-place  
 1807 Manners, 56, Upper Brook-street  
 1838 Metheun, 128, Park-street  
 1711 Middleton, 11, Montagu-street  
 1847 Milford, St. George's-hotel  
 1728 Monson, 1, Lincoln's-inn-fields  
 1839 Monteagle, 7, Park-street  
 1741 Montfort, 24, Upper Montagu-st.  
 1831 Mostyn, 9, Lower Seymour-street  
 1797 Norwich, 44, St. James's-place  
 1850 Overstone  
 1831 Panmure, 9, Cornwall-terrace  
 1603 Petre, 3, Mansfield-street  
 1827 Plunket  
 1831 Poltimore, 25, Grosvenor-square  
 1837 Portman, 38, Bryanstone-square  
 1821 Ravensworth, Percy Cross, Fulham.  
 1821 Rayleigh, United University-club  
 1802 Redesdale, 6, Park-place  
 1797 Ribblesdale  
 1802 Rivers  
 1782 Rodney  
 1796 Rossmore, Brooks's-club  
 1558 St. John, Carlton-club

1802 Sandys, 48, Curzon-street  
 1447 Saye and Sele, 43, Grosvenor-st.  
 1761 Scarsdale  
 1840 Seaton, G.C.B., G.C.H., U.S. Club  
 1784 Sherborne  
 1828 Skelmersdale, 55, Portland-place  
 1760 Sondes, 32, Grosvenor-square  
 1780 Southampton, 32, Curzon-street  
 1640 Stafford  
 1839 Stanley, of Alderley, 40, Dover-st.  
 1448 Stourton  
 1839 Stuart de Decies  
 1838 Sudeley, 35, Dover-street  
 1786 Suffield, 12, Gt. Marlborough-st.  
 1616 Teynham  
 1792 Thurlow, Fladong's-hotel  
 1523 Vaux of Harrowden, Limmer's-ho.  
 1762 Vernon, 12, Gt. Marlborough-st.  
 1841 Vivian, Reform-club  
 1780 Walsingham, 22, Arlington-street  
 1664 Ward, Park-lane  
 1839 Wenlock, 29, Berkeley-square  
 1826 Wharnccliffe, 9, Upper Brook-street  
 1492 Willoughby de Brooke, 21, Hill-st.  
 1313 Willoughby d'Eresby, 142, Piccadilly  
 1797 Wodehouse, Mivart's-hotel  
 1838 Wrottesley, Everall's-hotel  
 1829 Wynford, Maungny's-hotel

# IRISH PEERS.

*The following Irish Peers have seats in the House of Lords as Peers of the United Kingdom.*

1739 Besborough, E. (B. Ponsonby), Brooks's-club  
 1789 Carysfort, E. (B. Carysfort)  
 1763 Charlemont, E. (B. Charlemont), 49, Lower Grosvenor-street  
 1803 Clancarty, E. (V. Clancarty)  
 1825 Clanricarde, M. (B. Somerville), 2, Carlton-house-terrace  
 1776 Clanwilliam, E. (B. Clanwilliam), 32, Belgrave-square  
 1795 Clare, E. (B. Fitzgibbon), 35, Lowndes-square  
 1781 Clifden, V. (B. Mendip), Whitehall  
 1816 Conyngham, M. (B. Minster), 5, Hamilton-place  
 1620 Cork, E. (B. Boyle), 3, Hamilton-pl.  
 1762 Courtoun, E. (B. Saltersford)  
 1797 Cremorne, B. (B. Dartrey), 3, Gt. Stanhope-street  
 1725 Darnley, E. (B. Clifton)  
 1790 Donegal, M. (B. Fisherwick), 28, Lowndes-street  
 1800 Donoughmore, E. (V. Hutchinson), 17, Conduit-street  
 1789 Downshire, M. (E. Hillsborough), 21, Hanover-square  
 1791 Drogheda, M. (B. More)  
 1733 Egmont, E. (B. Lovell)  
 1801 Ely, M. (B. Loftus), Carlton-club  
 1789 Enniskillen, E. (B. Grinstead), Athenæum-club  
 1759 Fife, E. K. T. (B. Fife), Union-club  
 1628 Fingall, E. (B. Fingall), Brks.'s club.

- 1720 Gage, V. (B. Gage), 4, Whitehall-yard  
 1806 Gosford, E. (B. Worlingham), Brooks's-club  
 1800 Headfort, M. (B. Kenlis), Brooks's-club  
 1841 Kenmare, E. (B. Kenmare), 11, Belgrave-square  
 1768 Kingston, E. (B. Kingston)  
 1766 Leinster, D. (V. Leinster), 6, Carlton-house-terrace  
 1795 Leitrim, E. (B. Clements), 2, Grosvenor-square  
 1803 Limerick, E. (B. Foxford), 74, St. James's-street  
 1806 Lismore, V. (B. Lismore)  
 1816 Londonderry, M. (E. Vane), Hol-derness-house  
 1785 Longford, E. (B. Silchester), 24, Bruton-street  
 1660 Massareene, V. (B. Oriel)  
 1627 Meath, E. (B. Chaworth)  
 1781 Melbourne, V. (B. Melbourne), 12, Hyde-park-terrace  
 1717 Middleton, V. (B. Brodrick)  
 1760 Mornington, E. (B. Maryborough)  
 1825 Ormonde, M. (B. Ormonde)  
 1831 Ranfurly, E. (B. Ranfurly)  
 1771 Roden, E. (B. Clanbrassill), United Service-club  
 1771 Sefton, E. (B. Sefton), 37, Belgrave-square  
 1756 Shannon, E. (B. Carleton), 44, Brook-street  
 1816 Sheffield, E. (B. Sheffield), 20, Portland-place  
 1800 Sligo, M. (B. Monteagle)  
 1628 Strangford, V. (B. Penshurst)  
 1780 Waterford, M. (B. Tyrone), Mi-vart's-hotel

## SCOTCH PEERS.

*The following Scotch Peers have seats in the House of Lords as Peers of the United Kingdom.*

- 1632 Aberdeen, E. (V. Gordon), 7, Argyll-street  
 1701 Argyll, D. (B. Sundridge), 2, Hamilton-place  
 1703 Atholl, D. (E. Strange), Carlton-club  
 1650 Balcarres, E. (B. Wigan), 21, Berkeley-square  
 1647 Belhaven, B. (B. Hamilton), 30, Albemarle-street  
 1663 Buccleuch, D., K.G. (E. of Don-caster), Whitehall-gardens  
 1633 Dalhousie, E. (M. Dalhousie), (abroad)  
 1507 Eglinton, E. (B. Androssan), 10, St. James's-square  
 Elgin, E. (Baron)  
 1453 Errol, E. (B. Kilmarnock)  
 1620 Falkland, V. (B. Hunsdon)  
 1623 Galloway, E. (B. Stewart of Gar-lies), 45, Grosvenor-square

- 1703 Glasgow, E. (B. Ross)  
 1619 Haddington, E. (B. Melrose), 43, Berkeley-square  
 1643 Hamilton, D., K.G. (D. of Bran-don), 12, Portland-square  
 1599 Huntly, M. (B. Meldrum), 24, Chapel-street  
 1682 Kinnaird, L. (B. Rossie), 33, Gros-venor-street  
 1704 Kinnoul, E. (B. Hay), 58, Green-st.  
 Kintore, E. (as Baron Kintore)  
 1624 Lauderdale, E. (B. Lauderdale), 1, Regent-street  
 1675 Lennox, D. (D. Richmond), 51, Portland-place  
 1707 Montrose, D. (E. Graham), 45, Belgrave-square  
 1561 Moray, E. (B. Stuart)  
 1703 Rosebery, E. (B. Rosebery), 139, Piccadilly  
 1707 Roxburgh, D. (E. Innes), Claren-don-hotel  
 1703 Stair, E. (B. Oxenfoord)  
 1633 Wemyss, E. (B. Wemyss), 19, Strat-ford-place

## IRISH REPRESENTATIVE PEERS.

- 1793 Bandon, E., 40, Lowndes-square  
 1621 Blayney, B., 76, Jermyn-street  
 1800 Caledon, E., 5, Carlton-house-ter.  
 1812 Castlemaine, B., Carlton-club  
 1763 Charlemont, E., 49, Grosvenor-st.  
 1806 Charleville, E.  
 1800 Clarina, B., 45, Up. Grosvenor-st.  
 1790 Clonbrock, B.  
 1797 Crofton, P.  
 1723 Desart, E.  
 1776 De Vesci, V., 57, St. James's-st.  
 1785 Doneraile, V., Limmer's-hotel  
 1822 Downes, B., K.C.B., Carlton-club  
 1800 Dunally, B., Union-club  
 1822 Dunraven, E., 94, Eaton-square  
 1780 Erne, E.  
 1756 Farnham, B., 44, Brook-street  
 1816 Glengall, E., 34, Grosvenor-street  
 1806 Gosford, E., G.C.B., Brooks's-club  
 1793 Hawarden, V., 5, St. George's-pl.  
 1806 Lorton, V., 18, Chesham-place  
 1806 Rosse, E., Royal Society  
 1756 Lanesborough, E.  
 1795 Lucan, E., 20, Hanover-square  
 1781 Mountcashel, E., Conservative-club  
 1795 O'Neill, V., United Service-club  
 1822 Westmeath, M., 116, Pall Mall  
 1793 Wicklow, E., K.P., 2, Cavendish-sq.

## SCOTCH REPRESENTATIVE PEERS.

*Elected every Parliament.*

- 1509 Elphinstone, 14, St. George's-place  
 1445 Gray, B., St. George's-hotel  
 1605 Home, E.  
 1690 Leven, E.  
 1458 Morton, E., 7, Old Palace-yard  
 1696 Orkney, E.  
 1690 Polwarth, B., Carlton-club

1609 Colville, B.  
 1612 Blantyre, B.  
 1651 Rollo, B., Carlton-club  
 1701 Seafeld, E., Clarendon-hotel  
 1445 Saltoun, B., 1, Gt. Cumberland-st.  
 1489 Sinclair, B., United Service-club  
 1646 Selkirk, E., Grosvenor-hotel  
 1686 Strathallan, V., 44, Charles-street  
 1694 Tweeddale, M., K.T. (India)

#### IRISH BISHOPS.

Four of the Irish Bishops sit by annual rotation in the House of Lords. The following occupy seats at present:—  
 Archbp. of Armagh | Bishop of Down  
 Bishop of Derry | Bishop of Limerick

#### PEERS WHO ARE MINORS.

H.R.H. Albert Edward Prince of Wales, K.G..... 1862  
 Duke of St. Alban's .....  
 Marquis of Bath ..... 1852  
 Marquis of Bute..... 1868  
 Earl of Coventry ..... 1859  
 Earl of Dunmore ..... 1862  
 Earl of Granard ..... 1854  
 Marquis of Hastings..... 1853

Viscount Hood ..... 1859  
 Earl of Hopetoun ..... 1852  
 Marquis of Lothian ..... 1853  
 Baron Lurgan ..... 1852

#### ELDEST SONS OF PEERS.

The following have seats in the House of Lords.

<i>Title of courtesy</i>	<i>Sits as</i>	<i>Son of</i>
Bruce, Earl .. B. Bruce ..	M. Ailesbury	
Stanley, Lord .. B. Stanley ..	E. of Derby	
Uxbridge, Earl B. Paget ..	M. Anglesey	
Acheson, Vic. .. B. Acheson ..	E. Gosford	
Hn. E. J. Stanley	B. Eddisbury	B. Stanley

#### PEERESSES IN THEIR OWN RIGHT.

1840 Duchess of Inverness  
 1264 Baroness le Despencer  
 1299 Baroness de Clifford  
 1308 Baroness de la Zouche  
 1324 Baroness Grey de Ruthyn  
 1509 Baroness Braye  
 1554 Baroness North  
 1794 Baroness Basset  
 1803 Baroness Keith  
 1834 Baroness Wenman  
 1836 Baroness Stratheden

### MEMBERS OF THE HOUSE OF COMMONS.

#### ENGLAND AND WALES, 498 MEMBERS.

*Speaker.*—Rt. Hon. C. S. Lefevre.

*Abingdon.*—Sir F. Thesiger, 11, Bryanstone-square  
*Andover.*—J. H. Coles, 25, Portman-sq.  
*W. Cubitt, Gray's-inn-road*  
*Anglesea.*—Sir R. B. Bulkeley, Bart., 87, Eaton-square  
*Arundel.*—Earl of Arundel, 11, Carlton-house-terrace  
*Ashburton.*—Lt.-Col. T. Mattheson, 8, St. James's-street  
*Ashton-under-Lyne.*—C. Hindley, Dartmouth-house, Westminster  
*Aylesbury.*—Q. Dick, 20, Curzon-street.  
 Lord Nugent, Reform-club  
*Banbury.*—H. W. Tancred, 104, Pall Mall  
*Barnstaple.*—R. Bremridge, 16, Regent-street.  
 Hon. J. Fortescue, 17, Grosvenor-square  
*Basset Law.*—Hon. A. Duncombe, 22, Grosvenor-square.  
 Vict. Galway, 45, Brook-street  
*Bath.*—Viscount Duncan, 15, Hill-street.  
 Lord Ashley, 49, Upper Brook-street  
*Beaumaris.*—Lord G. Paget, 1, Old Burlington-street  
*Bedford.*—H. Stuart, 18, Hill-street.  
 Sir H. Verney, Bart., 5, Park-street

*Bedfordshire.*—Visc. Alford, 23, Belgrave-square.  
 F. C. H. Russell, 8, Eaton-place  
*Berkshire.*—R. Palmer, 16, Suffolk-st.  
 Visct. Barrington, 20, Cavendish-sq.  
 P. Pusey, 35, Grosvenor-square  
*Berwick-upon-Tweed.*—M. Foster, 5, New City-chambers.  
 J. C. Renton, Conservative-club  
*Beverley.*—J. Townelay, 76, Eaton-place.  
 S. W. L. Fox, 3, St. James's-square  
*Bewdley.*—Lord Mandeville, 129, Mount-street  
*Birmingham.*—G. F. Muntz, 2, St. James's square.  
 W. Scholefield, Reform-club  
*Blackburn.*—J. Hornby, 22, Park-cres.  
 J. Pilkington, Queen's-hotel  
*Bodmin.*—J. Wyld, Charing-cross East.  
 H. C. Lacy, Richmond  
*Bolton.*—Sir J. Walmesley, 101, Hyde-park-terrace.  
 Stephen Blair  
*Boston.*—Capt. Anderson, R.N.  
 B. B. Cabbell, 1, Brick-court  
*Bradford.*—W. Busfield, 15, Bury-street.  
 Col. P. Thompson, Free Trade-club  
*Brecknockshire.*—J. Bailey, 26, Belgrave-square  
*Brecon.*—Col. J. L. V. Watkins, Athenæum-club  
*Bridgnorth.*—T. C. Whitmore, Carlton-club.  
 Sir R. Pigot, Bart., London-hotel



- Bridgwater*.—H. Broadwood, 9, Argyll-st. C. K. Tynte, Brooks's-club
- Bridport*.—T. A. Mitchell, B 6, Albany. B. Cochrane, Farrance's-hotel
- Brighton*.—Capt. Pechell, 6, Stratford-place. Lord A. Hervey, 6, St. James's-square
- Bristol*.—P. W. S. Miles, 44, Belgrave-square. Hon. F. Berkeley, 1, Victoria-square
- Buckingham*.—Marquis of Chandos, Carlton-club. Col. J. Hall, Hyde-park-barracks
- Buckinghamshire*.—Hon. C. Cavendish, Burlington-house. C. Du Pre, 40, Portland-place. B. Disraeli, 1, Grosvenor-gate
- Bury*.—R. Walker, 5, Gt. Ryder-street
- Bury St. Edmunds*.—Earl Jermyn, 47, Eaton-place. E. H. Bunbury, 15, Jermyn-street
- Calne*.—Earl of Shelburne, Lansdowne-house
- Cambridge*.—Hon. W. Campbell, Stratheden-house. A. S. Adair, 2, Chapel-street
- Cambridgeshire*.—Hon. E. Yorke, 144, Park-street. R. Townley, Limmer's-hotel. Lord G. Manners, Knights-bridge-barracks
- Cambridge University*.—H. Goulburn. Hon. C. E. Law, 72, Eaton-place
- Canterbury*.—Hon. G. Smythe, 68, Harley-street. Col. Romilly
- Cardiff Boroughs*.—Rt. Hon. Dr. Nickoll, 33, Belgrave-square
- Cardigan, &c.*—P. Pryse, Gloucester-hotel
- Cardiganshire*.—Col. W. E. Powell, 7, Hyde-park-terrace
- Carlisle*.—W. N. Hodgson. P. H. Howard, 15, Gloucester-place
- Carmarthen, &c.*—D. Morris, 8, St. James's-place
- Carmarthenshire*.—Hon. G. Trevor, 11, Hyde-park-gardens. D. A. S. Davies, University-club
- Carnarvon*.—W. B. Hughes, Carlton-club
- Carnarvonshire*.—Hon. E. G. Pennant, 36, Belgrave-square
- Chatham*.—Right Hon. Visc. Enfield, 95, Eaton-square
- Cheltenham*.—C. L. G. Berkeley
- Cheshire, North*.—W. T. Egerton, 43, Wilton-crescent. Geo. C. Leigh, Knightsbridge
- Cheshire, South*.—Sir P. Egerton, Bart., Carlton-club. J. Tollemache, 40, Wilton-crescent
- Chester*.—Earl Grosvenor, 33, Up. Grosvenor-street. Sir J. Jervis, 47, Eaton-square
- Chichester*.—Lord H. Lennox, 51, Portland-place. J. A. Smyth, 47, Belgrave-square
- Chippenham*.—J. Neeld, 6, Grosvenor-sq. Capt. H. Boldero, Carlton-club
- Christchurch*.—Hon. E. Harris, 8, Whitehall-gardens
- Cirencester*.—J. R. Mullings, 40, Duke-street. Viscount Villiers, 38, Berkeley-square
- Clitheroe*.—M. Wilson, 65, Quadrant
- Cockermouth*.—H. A. Aglionby, 5, Brick-court. E. Horsman, 6, Upper Brook-street
- Colchester*.—Lord J. Manners, 94, Pall Mall. J. A. Hardcastle, 19, Whitehall-place
- Cornwall, East*.—W. H. Carew, 38, St. James's-place. T. I. A. Robartes, 42, Westbourne-terrace
- Cornwall, West*.—E. Pendarves, 36, Eaton-pl. Sir C. Lemon, Bart., 46, Charles-street
- Coventry*.—Rt. Hon. E. Ellice, 11, Arlington-street. G. J. Turner, 23, Park-crescent
- Cricklade*.—J. Neeld, 101, Gloucester-place. A. L. Goddard, 58, Chester-sq.
- Cumberland, East*.—Hon. C. Howard, 56, Park-st. W. Marshall, 85, Eaton-square
- Cumberland, West*.—E. Stanley, Carlton-club. H. Lowther, 31, Bruton-street
- Dartmouth*.—G. Moffat, 103, Eaton-sq.
- Denbigh Borough*.—F. R. West, Carlton-club
- Denbighshire*.—Sir W. Wynn, Bart., 18, St. James's-sq. Hon. W. Bagot, 23, St. James's-square
- Derby*.—L. Heyworth. M. T. Bass
- Derbyshire, North*.—Hon. G. Cavendish, 4, Belgrave-sq. W. B. Evans, Park-house
- Derbyshire, South*.—W. Mundy, 19, Pall Mall. C. R. Colville, B 4, Albany
- Devizes*.—Lieut.-Col. J. B. Estcourt, 82, Eaton-pl. G. H. Heneage, Grosvenor-hotel
- Devonport*.—H. Tuffnell, 37, Curzon-st. Sir J. Romilly, 32, Gordon-square
- Devonshire, North*.—Sir T. Acland, Bt., Waterloo-hotel. L. W. Buck, 12, Norfolk-street
- Devonshire, South*.—Sir J. Buller, Bt., 39, Belgrave-square. Sir R. Lopes, Bt., 46, Grosvenor-street
- Dorchester*.—Col. G. Damer, 2, Audley-square. H. C. Sturt, 16, Portman-sq.
- Dorsetshire*.—H. K. Seymour, Carlton-club. G. Banks, 5, Old Palace-yard. J. Floyer, 5, Old Palace-yard
- Dover*.—Sir G. Clerk, Bart., 8, Park-st. E. R. Rice, United University-club
- Droitwich*.—Sir J. S. Packington, 41, Eaton-square
- Dudley*.—J. Benbow, 26, Mecklenburg-square
- Durham*.—T. Granger, 12, King's-bench-walk. H. J. Spearman, 2, Grafton-st.



*Durham County, North.*—R. D. Shafto, Boodle's-club. Visc. Scham, Mivart's-hotel

*Durham County, South.*—Lord H. Vane, 1, Grosvenor-place-houses. J. Farrer, 14, Queen-street, May-fair

*Essex, North.*—Sir J. Tyrrell, Bart., Carlton-club. Major Beresford, 2, Eaton-square

*Essex, South.*—T. Bramston. Sir E. Buxton, Bart., 10, Up. Grosvenor-street

*Eresham.*—Lord M. Hill, 2, Chesham-st. Sir H. Willoughby, Bart., 63, Lower Brook-street

*Exeter.*—E. Divett, 97, Eaton-sq. Sir J. Duckworth, 109, Jermyn-street

*Eye.*—Sir E. Kerrison, Bart., 13, Great Stanhope-street

*Finsbury.*—T. Wakley, 1, Bedford-st. T. S. Duncombe, Palace-chambers

*Flint Boroughs.*—Sir J. Hanmer, Bart., 59, Eaton-place

*Flintshire.*—Hon. F. Mostyn, 9, Lower Seymour-street

*Frome.*—Col. Boyle, 26, Hill-street

*Gateshead.*—W. Hutt, 39, Maddox-st.

*Glamorganshire.*—Viscount Adare, 94, Eaton-square. C. R. M. Talbot, 3, Cavendish-square

*Gloucester.*—H. T. Hope, 1, Mansfield-st. Hon. M. Berkeley, Admiralty

*Gloucestershire, East.*—Marquis of Worcester, 27, Berkeley-square. Sir C. Codrington, 3, Park-place

*Gloucestershire, West.*—Hon. G. Berkeley, Cox's-hotel. R. B. Hale, 15, Bolton-street

*Grantham.*—G. E. Welby, 8, Upper Belgrave-street. Hon. F. Tollemache, Athenæum-club

*Great Grimsby.*—E. Heneage, 39, Charles-street

*Greenwich.*—J. W. D. Dundas, Admiralty. E. G. Barnard, Deptford

*Guildford.*—Capt. R. Mangles, Athenæum-club. H. Currie

*Halifax.*—Sir C. Wood, Bart., 12, Downing-street. Capt. H. Edwards, Conservative-club

*Hampshire, North.*—C. S. Lefevre (the Speaker). Melville Portal

*Hampshire, South.*—H. C. Compton, 34, Upper Eaton-st. Lord C. Wellesley, Apsley-house

*Harwich.*—Sir J. C. Hobhouse, Bt., 42, Berkeley-sq. J. Bagshaw, 10, Bridge-street

*Hastings.*—M. Brisco, 38, Devonshire-place. R. Holland, 63, Portland-pl.

*Haverfordwest.*—J. Evans, 11, Crown-office-row

*Helston.*—Sir R. Vyvyan, Bart., St. Dunstan's-villa

*Hereford.*—Sir R. Price, Bt., 11, Stratton-st. H. Clifford

*Herefordshire.*—J. Bailey, jun., 26, Belgrave-sq. G. Lewis, Kent-ho. R. Haggitt, Maungy's-hotel

*Hertford.*—Viscount Mahon, 41, Grosvenor-pl. Hon. W. F. Cowper, Admty.

*Hertfordshire.*—T. P. Hasley, Carlton-club. Sir H. Meux, Bt., 41, Up. Brook-st. T. Brand, Burlington-house

*Honiton.*—J. Locke, 6, Chester-ter. Sir W. Hogg, Bart., 16, Grosvenor-sq.

*Horsham.*—Lord Howard, 12, St. James's-square

*Huddersfield.*—W. R. Stansfield, 22, Charles-street

*Hull.*—J. Clay, 25, Montague-sq. M. T. Baines, Somerset-pl.

*Huntingdon.*—Col. J. Peel, 8, Park-pl. T. Baring, 40, Charles-st.

*Huntingdonshire.*—J. Fellowes, 3, Belgrave-sq. G. Thornhill, 17, Lower Grosvenor-st.

*Hythe.*—E. D. Brockman, Reform-club

*Ipswich.*—J. C. Cobbold, Athenæum-club. H. E. Adair, 2, Chapel-st. W.

*Kendal.*—G. C. Glynn, 1, Up. Eccleston-st.

*Kent, East.*—J. P. Plumtre, University-club. W. Deedes

*Kent, West.*—Sir E. Filmer, 90, Eaton-sq. T. L. Hodges, 15, Suffolk-st.

*Kidderminster.*—J. Best, Inner Temple-hall

*Knaresborough.*—Hon. W. Lascelles, Carlton-club. J. P. Westhead, 1, Chester-terrace

*Lambeth.*—C. D'Eyncourt, Reform-club. C. Pearson, 10, Park-st.

*Lancashire, North.*—J. W. Patten, 24, Hill-street. J. Heywood, Maungy's-hotel

*Lancashire, South.*—W. Brown, Fenton's-hotel. A. Henry, Free-Trade-club

*Lancaster.*—T. Greene, 19, Duke-st., Westmr. R. B. Armstrong, 29, Chester-square

*Launceston.*—Rear-Adm. W. Bowles, 8, Hill-street

*Leeds.*—W. Beckett, 18, Up. Brook-st. J. G. Marshall, 37, South-street

*Leicester.*—J. Ellis. R. Harris

*Leicestershire, North.*—Lord C. Manners, 3, Albany. E. B. Farnham, Maungy's-hotel

*Leicestershire, South.*—Sir H. Halford, Bt., 5, Albert-road. C. W. Packe, 7, Richmond-terrace

*Leominster.*—F. Peel, 4, Whitehall-gardens. G. Arkwright, 2, Albany

*Lewes.*—Hon. H. Fitzroy, 42, Upper Grosvenor-st. R. Perfect, 14, Gloucester-square

*Lichfield.*—Lord A. H. Paget, 18, Berkeley-square. Viscount Anson, c5, Albany

*Lincoln.*—Col. C. D. W. Sibthorp, 27, Chester-street. T. B. Hobhouse, 5, Brick-court

- Lincolnshire, North.*—R. A. Christopher, 23, Chesham-place. Sir M. Cholmeley, 10, Upper Belgrave-st.
- Lincolnshire, South.*—Sir J. Trollope, 35, Portland-pl. Lord Burghley
- Liskeard.*—R. B. Crowder, 17, Carlton-house-terrace
- Liverpool.*—Sir T. Birch, Bt., 55, Jermyn-st. E. Cardwell, 3, Whitehall-gard.
- London.*—Lord J. Russell, 32, Chesham-place. Sir J. Duke, Reform-club. Baron L. de Rothschild, 148, Piccadil. J. Masterman, 35, Nicholas-lane
- Ludlow.*—H. B. Clive, Carlton-club. H. Salway, Reform-club
- Lyne Regis.*—T. N. Abdy, 65, S. Audley-st.
- Lymington.*—W. A. Mackinnon, 4, Hyde-park-pl. Col. Keppel, 12, Stanhope-place
- Lynn Regis.*—Visc. Jocelyn, Kew-green. Hon. E. Stanley, 2, Grosvenor-crescent
- Macclesfield.*—J. Brocklehurst, 33, Milk-st. J. Williams, 111, Oxford-st.
- Maidstone.*—A. J. B. Hope, 1, Connaught-pl. G. Dodd, 9, Grosvenor-pl.
- Malden.*—T. B. Lennard, 9, Hyde-park-ter. D. Waddington, 12, Haymarket
- Malmesbury.*—Hon. J. K. Howard
- Malton.*—J. E. Dennison, Burlington-ho. J. W. Childers, 100, Eaton-sq.
- Manchester.*—Rt. Hon. T. M. Gibson, 50, Wilton-crescent. J. Bright, Free-Trade-club
- Marlborough.*—Lord E. Bruce, 7, St. George's-place. Major H. B. Baring
- Marlow.*—T. P. Williams, 41, Berkeley-square. Col. B. Knox, 28, Wilton-crescent
- Marylebone.*—Sir B. Hall, Bt., Brooke's-club. Lord D. C. Stuart, 34, St. James's-place
- Merionethshire.*—R. Richards, 21, Park-crescent
- Merthyr Tydvil.*—Sir J. J. Guest, Bart., 8, Spring-gardens
- Middlesex.*—Lord R. Grosvenor, 107, Park-st. R. Osborne, Reform-club
- Midhurst.*—S. H. Walpole, 15, Old-sq.
- Monmouthshire.*—Capt. E. A. Somerset. C. O. S. Morgan, 9, Pall-mall
- Monmouth Boroughs.*—R. J. Blewitt, Reform-club
- Montgomeryshire.*—C. W. W. Wynn, 20, Grafton-street
- Montgomery, &c.*—D. Pugh, 1, Cork-st.
- Morpeth.*—Hon. E. G. Howard, 83, Eaton-place
- Newark.*—M. Sutton, A 6, Albany. J. Stuart, 19, Hertford-street
- Newcastle-under-Lyne.*—S. Christy, 2, Park-street. W. Jackson, 33, Bruton-street
- Newcastle-upon-Tyne.*—W. Ord, 17, Berkeley-square. T. E. Headlam, 30, Lincoln's-inn-fields
- Newport, Isle of Wight.*—C. W. Martin, 3, Suffolk-street. W. H. Plowden, 9, Devonshire-place
- Norfolk, East.*—H. N. Burroughes, Carlton-club. E. Wodehouse, Limmer's-hotel
- Norfolk, West.*—W. Bagge, Carlton-club. Hon. E. K. Coke, 1, St. James's-street
- Northallerton.*—W. B. Wrightson, 22, Upper Brook-street
- Northampton.*—R. V. Smith, 20, Saville-row. R. Currie, 4, Hyde-park-ter.
- Northamptonshire, North.*—T. P. Maunsell, Carlton-club. A. Stafford, 175, Piccadilly
- Northamptonshire, South.*—Sir C. Knightly, Bart., 10, Upper Brook-street. R. H. A. Vyse, Knightsbridge-barracks
- Northumberland.*—Lord Ossulston, 17, South-street. Sir G. Grey, Bart., 14, Eaton-place
- Northumberland, South.*—M. Bell. S. C. H. Ogle, 26, Pall Mall
- Norwich.*—Marquis of Douro, 3, Upper Belgrave-st. S. M. Peto, 47, Russell-sq.
- Nottingham.*—J. Walter, 40, Upper Grosvenor-street. F. O'Connor
- Nottinghamshire, North.*—T. Houldsworth, 18, Suffolk-street. Lord H. Bentinck, 19, Cavendish-square
- Nottinghamshire, South.*—T. B. T. Hildyard, 45, Eaton-square. R. Bromley
- Oldham.*—W. J. Fox, 5, Charlotte-street. J. Duncuft, 3, Old Palace-yard
- Oxford.*—J. H. Langston, 143, Piccadilly. W. P. Wood, 12, Gt. George-st.
- Oxfordshire.*—Lord Norreys, 18, Grosvenor-street. G. Harcourt, 5, Carlton-house-terrace. J. Henley, 22, Great George-street
- Oxford University.*—Sir R. Inglis, Bart., 7, Bedford-place. Rt. Hon. W. Gladstone, 6, Carlton-gardens
- Pembroke, &c.*—Sir J. Owen, Bart., Arthur's-club
- Pembrokeshire.*—Viscount Emlyn, 3, Tilney-street
- Penryn and Falmouth.*—H. Gwynn, Carlton-club. F. Mowatt, 14, Devonshire-place
- Peterborough.*—Hon. G. Fitzwilliam, Halkin-st. W. G. Cavendish, Burlington-house
- Petersfield.*—Sir W. Jolliffe, Bart., Carlton-club
- Plymouth.*—Viscount Ebrington, 17, Grosvenor-square. R. Palmer, 11, New-square
- Pontefract.*—R. M. Milnes, 26, Pall Mall. S. Martin, 79, Eaton-place
- Poole.*—G. R. Phillips, 12, Hill-st. Rt. Hon. G. Robinson, 27, Chester-ter.
- Portsmouth.*—Rt. Hon. Sir F. T. Baring, Bart., Admiralty. Sir G. Staunton, Bart., 17, Devonshire-street

*Preston*.—C. P. Grenfell, 38, Belgrave-square. Sir G. Strickland, Bart., 123, Piccadilly  
*Radnor Boroughs*.—Rt. Hon. Sir T. F. Lewis, 21, Grafton-street  
*Radnorshire*.—Sir J. B. Walsh, Bart., 28, Berkeley-square  
*Reading*.—F. Pigott, Reform-club. J. F. Stanford, 7, Langham-place  
*Reigate*.—T. S. Cocks, 15, Hereford-street  
*Richmond*.—H. Rich, 47, Mount-street. M. Wyvill, jun., Oxford and Cambridge-club  
*Ripon*.—Sir J. Graham, Bart., 46, Grosvenor-pl. Hon. E. Lascelles, 4, Belgrave-square  
*Rochdale*.—W. S. Crawford  
*Rochester*.—R. Bernal, 93, Eaton-square. T. T. Hodges, 169, New Bond-street  
*Rutlandshire*.—G. J. Heathcote, 12, Langham-place. Hon. G. Noel, 9, Cavendish-square  
*Rye*.—H. B. Curteis, Fenton's-hotel  
*St. Alban's*.—A. Raphael, 10, Great Stanhope-street. G. W. J. Repton, 66, Pall Mall  
*St. Ives*.—Lord W. Paulett, 19, Curzon-street  
*Salford*.—J. Brotherton, 7, Manchester-buildings  
*Salisbury*.—W. J. Chaplin, 1, Adelphi-terrace. C. B. Wall, 44, Berkeley-square  
*Sandwich*.—Lord C. Paget, 1, Old Burlington-street. C. W. Grenfell, 38, Belgrave-square  
*Scarborough*.—Sir J. Johnstone, Bart., 27, Grosvenor-sq. Earl Mulgrave, 56, Eaton-place  
*Shaftesbury*.—R. B. Sheridan, 8, Chesterfield-street  
*Sheffield*.—J. Parker, Admiralty. J. A. Roebuck  
*Shoreham, New*.—Sir C. Burrell, Bart., 5, Richmond-terrace. C. Goring, 26, Pall Mall  
*Shrewsbury*.—E. H. Baldock, 5, Hyde-park-place. R. A. Slaney, University-club  
*Shropshire, North*.—W. O. Gore, 66, Portland-place. J. W. Dod, 37, Jermyn-street  
*Shropshire, South*.—Hon. H. R. Clive, 53, Lower Grosvenor-st. Viscount Newport, 30, Wilton-crescent  
*Somersetshire, East*.—W. Miles, 7, Hamilton-place. W. Pinney, 30, Berkeley-square  
*Somersetshire, West*.—Sir A. Hood, Bart., 43, Wimpole-st. C. A. Moody  
*Southampton*.—C. Cockburn, 3, Harcourt-buildings. B. M. Wilcox, 24, Dorset-square  
*South Shields*.—J. T. Wawn, Reform-club

*Southwark*.—Ald. Humphrey, Hibernian-wharf. Sir W. Molesworth, Bart., 87, Eaton-place  
*Staffordshire, North*.—C. B. Adderley, Carlton-club. Lord Brackley, 15 A, Hill-street  
*Staffordshire, South*.—Hon. G. Anson, 25, Hill-street. Viscount Lewisham, 23, St. James's-square  
*Stafford*.—D. Urquhart, 28, Clarges-st. Ald. Sidney, 8, Ludgate-hill  
*Stamford*.—J. C. Herries, Carlton-club. Marquis of Granby, 102, Piccadilly  
*Stockport*.—J. Kershaw, Free-trade-club. J. Heald, 3, Old Palace-yard  
*Stoke-upon-Trent*.—J. L. Ricardo, 31, Lowndes-square. Ald. Copeland, 160, New Bond-street  
*Stroud*.—W. H. Stanton, Reform-club. G. P. Scrope, 13, Belgrave-square  
*Suffolk, East*.—E. S. Gooch, 16, Lowndes-square. Lord Rendlesham, Travellers'-club  
*Suffolk, West*.—P. Bennett, jun., 12, Eaton-place. H. S. Waddington, 45, St. James's-place  
*Sunderland*.—Sir H. Williamson, Bart. G. Hudson, Albert-gate  
*Surrey, East*.—Hon. P. J. L. King, 38, Dover-street. T. Alcock, 5, Lowndes-street  
*Surrey, West*.—W. J. Evelyn. H. Drummond, 50, Chester-square  
*Sussex, East*.—C. H. Frewen, 3, Old Palace-yard. A. E. Fuller, 16, Clifford-street  
*Sussex, West*.—E. of March, 51, Portland-place. R. Prime  
*Swansea*.—J. H. Vivian, 104, Eaton-sq.  
*Tamworth*.—Sir R. Peel, Bart., Whitehall-gardens. Captain Townsend, 4, Clarendon-place  
*Taunton*.—H. Labouchere, 27, Belgrave-square. Sir T. Colebrooke, Bart., 18, Park-lane  
*Tavistock*.—Hon. E. S. Russell, 3, Carlton-house-terrace. J. S. Trelawney, Reform-club  
*Twickenham*.—J. Martin, 14, Berkeley-square. H. Brown, 2, Little Smith-street  
*Thetford*.—Hon. F. Baring, 14, Pall Mall. Earl of Euston, 47, Clarges-street  
*Thirsk*.—J. Bell  
*Tiverton*.—J. Heathcoat, 5, Warwick-st. Viscount Palmerston, 4, Carlton-gar.  
*Tolness*.—Lord Seymour, 18, Spring-gardens. C. B. Baldwin, Union-club  
*Tower Hamlets*.—Sir W. Clay, Bart., 17, Hertford-street. G. Thomson, 6 A, Waterloo-place  
*Truro*.—J. E. Vivian, Batt's-hotel. H. Willyams, 46, Duke-street  
*Tynemouth*.—R. W. Gray, 47, Belgrave-square  
*Wakefield*.—G. Sandars



*Wallingford*.—W. S. Blackstone, Carlton-club  
*Walsall*.—Hon. E. R. Littleton  
*Wareham*.—J. Drax, King-street  
*Warrington*.—G. Greenhall, 3, Old Palace-yard  
*Warwick*.—W. Collins, 4, Pelham-cres. Sir C. E. Douglas, 27, Wilton-cres.  
*Warwickshire, North*.—R. Spooner, 40, Duke-street. C. N. Newdegate, 3, Arlington-street  
*Warwickshire, South*.—Lord Guernsey. Lord Brooke, 7, Carlton-gardens  
*Wells*.—W. G. Hayter, 11, Hyde Park-terrace. R. Blackmore, 15, Regent-st.  
*Wenlock*.—Hon. G. C. Forester, 21, Charles-street. J. M. Gaskell, 72, Lower Grosvenor-street  
*Westbury*.—J. Wilson, 15, Hertford-st.  
*Westminster*.—Sir De L. Evans, 26, Bryanstone-square. C. Lushington, 1, Palace-gardens  
*Westmoreland*.—Col. Hon. H. Lowther, 31, Bruton-street. Ald. Thompson, 12, Whitehall-place  
*Weymouth*.—Col. W. L. Freestun, Junior United Service Club. Hon. F. W. C. Villiers  
*Whitby*.—R. Stephenson, 24, Gt. George-street  
*Whitehaven*.—R. C. Hildyard, 9, Kensington-gore  
*Wigan*.—R. A. Thickness. Hon. J. Lindsay, 21, Berkeley-square  
*Isle of Wight*.—J. Simeon, 4, Eaton-pl.  
*Wilton*.—Vis. Somerton, 3, Seamore-pl.  
*Wiltshire, North*.—T. H. S. Sotherton, 51, Eaton-place. W. Long, 29, Hill-st.  
*Wiltshire, South*.—Hon. S. Herbert, 5, Carlton-gardens. J. Bennett, Limer's-hotel  
*Winchester*.—Sir J. B. East, Bt., 117, Eaton-sq. I. B. Carter, 20, New-st.  
*Windsor*.—Col. G. A. Reid, United University-club  
*Wolverhampton*.—Hon. C. P. Villiers, Free Trade-club. T. Thornley, 24, Regent-street  
*Woodstock*.—Marquis of Blandford, 3, Wilton-terrace  
*Worcester*.—O. Ricardo, 71, Eaton-place. F. Rufford, 94, Pall Mall  
*Worcester, East*.—Captain Rushout, Charles-street. J. H. H. Foley  
*Worcester, West*.—Lt.-Gen. H. B. Lygon, 16, Grosvenor-place. F. W. Knight, 10, Dover-street  
*Wycombe*.—G. H. Dashwood, 248, Oxford-street. M. T. Smith, 13, Upper Belgrave-street  
*Yarmouth*.—J. Sanders, 4, St. James's-place. C. E. Rumbold  
*York*.—J. G. Smyth, 17, Lowndes-sq. W. M. E. Milner, 75, Eaton-place  
*Yorkshire, East*.—H. Broadley, 3, Charles-street. Lord Hotham, 7, Hill-street

*Yorkshire, North*.—E. S. Cayley. Hon. O. Duncombe  
*Yorkshire, West*.—R. Cobden, 103, Westbourne-ter. E. Denison, 3, Hobart-pl.

## IRELAND.

105 MEMBERS.

*Antrim County*.—N. Alexander, Cox's-hotel. Sir E. Macnaghten, 42, Upper Brook-street  
*Armagh*.—Col. Rawdon, 3, Great Stanhope-street  
*Armagh County*.—Col. J. Cauldfield, Brooke's-club. Sir W. Verner, Bart., 86, Eaton-square  
*Athlone*.—W. Keogh, Carlton-club  
*Bandon Bridge*.—Viscount Bernard  
*Belfast*.—R. J. Tennent, Reform-club. Lord J. Chichester, 8, St. George's-pl.  
*Carlton*.—J. Sadleir, D 4, Albany  
*Carlow County*.—Col. H. Bruen, Carlton-club. W. B. Bunbury, Carlton-club  
*Carrickfergus*.—Hon. W. H. S. Cotton, Carlton-club  
*Cashel*.—Sir T. O'Brien, Bart., 14, Jermy-street  
*Cavan County*.—J. Young, 19, Chesham-pl. Hon. J. P. Maxwell, 46, Duke-st.  
*Clare County*.—Maj. W. Macnamara, Jun. Uni. Service-club. Sir L. O'Brien, Bart., Reform-club  
*Clonmel*.—Hon. C. Lawless  
*Coleraine*.—Dr. J. Boyd, 2, Pall Mall  
*Cork*.—W. Fagan. Col. Chatterton  
*Cork County*.—E. B. Roche, Reform-club. Dr. M. Power  
*Donegal County*.—Sir E. S. Hayes. T. Conolly, 19, Hanover-square  
*Down County*.—Visc. Castlereagh, 25, Chesham-place. Lord E. Hill  
*Downpatrick*.—R. Ker, 11, Upper Grosvenor-street  
*Drogheda*.—Sir W. M. Somerville, 62, Lowndes-square  
*Dublin*.—E. Grogan, Carlton-club. J. Reynolds  
*Dublin County*.—J. H. Hamilton, Carlton-club. Lt.-Col. E. Taylor, Carlton-club  
*Dublin University*.—J. Napier, 3, Old Palace-yard. G. A. Hamilton, Carlton-club  
*Dundalk*.—W. T. M'Cullagh, 23, Cado-gan-place  
*Dungannon*.—Viscount Northland, 5, Bolton-row  
*Dungarvon*.—R. L. Sheil, 73, Eccleston-square  
*Ennis*.—O'Gorman Mahon  
*Enniskillen*.—Hon. H. A. Cole, 5, John-street, Berkeley-square  
*Fermanagh*.—Capt. M. Archdall, Carlton-club. Sir A. Brooke, Bt., Carlton-club  
*Galway*.—M. J. Blake, Reform-club. A. O'Flaherty, 26, Grosvenor-street



*Galway County.*—Sir T. J. Burke, Bart., 112, Jermyn-street. C. St. George, Union-club  
*Kerry County.*—H. A. Herbert, 3, Grosvenor-crescent. M. J. O'Connell  
*Kildare County.*—Marq. of Kildare, 6, Carlton-house-terrace. Lord Naas  
*Kilkenny.*—M. Sullivan, Queen's-hotel  
*Kilkenny County.*—P. S. Butler, Delahay-street. J. Greene, 4, Charles-st.  
*King's County.*—Sir A. Armstrong, Bt., Reform-club. Hon. J. Westerna, Brooke's-club  
*Kinsale.*—B. Hawes, 9, Queen-street West  
*Leitrim County.*—E.K. Tenison, Brooke's-club. Hon. C. Clements, 2, Grosvenor-square  
*Limerick.*—J. O'Connell, 1, Lower Grosvenor-street. J. O'Brien, Reform-club  
*Limerick County.*—W. Monsell, 94, Eaton-square. S. Dickson  
*Lisburn.*—Sir H. B. Seymour, 28, St. James's-place  
*Londonderry.*—Sir R. A. Ferguson, Bt., United University-club  
*Londonderry County.*—T. Bateson. Capt. T. Jones, 30, Charles-street  
*Longford County.*—R. M. Fox. S. Blackall, jun., Junior United Service-club  
*Louth County.*—R. M. Bellew, Brooke's-club. C. Fortescue, Alfred-club  
*Mallow.*—Sir C. D. J. Norreys, Bart., Athenaeum  
*Mayo County.*—G. H. Moore, 9, Little Rider-st. R. D. Browne, Reform-club  
*Meath County.*—H. Grattan, 6, Sackville-street. M. E. Corbally, 20, Regent-street  
*Monaghan County.*—Hon. V. Dawson, 3, Great Stanhope-street. C. P. Leslie, 48, Berkeley-square  
*New Ross.*—J. H. Talbot, Reform-club  
*Newry.*—Viscount Newry and Morne, Carlton-club  
*Portarlington.*—Colonel Dunne, Junior United Service-club  
*Queen's County.*—J. W. Fitzpatrick, Clarendon-hotel. Hon. T. Vesey, 1, Grafton-street  
*Roscommon County.*—F. French, 54, Parliament-street. O. D. Grace, Brooke's-club  
*Sligo.*—J. P. Somers, Reform-club  
*Sligo County.*—W. R. O. Gore, 66, Portland-place. J. Ffolliott, Carlton-club  
*Tipperary County.*—N. R. Maher, Reform-club. F. Scully, Reform-club  
*Tralee.*—M. O'Connell, Reform-club  
*Tyrone County.*—Hon. H. T. L. Corry, 24, Grosvenor-square. Lord C. Hamilton, 19, Eaton-square  
*Waterford.*—Sir H. W. Barron, 21, Cavendish-square. T. Meagher, Ford's-hotel

*Waterford County.*—N. M. Power, 80, Chester-square. R. Keating, 2, Bedford-row  
*Westmeath County.*—Sir P. F. Nugent, Queen's-hotel. W. Magan, Army and Navy Club  
*Wexford.*—J. T. Devereux, 93, Gloucester-place  
*Wexford County.*—J. Fagan, 25, Craven-street. H. K. G. Morgan, 7, Lower Brook-street  
*Wicklow County.*—Sir R. Howard, 17, Belgrave-square. Viscount Milton, 4, Grosvenor-square  
*Youghal.*—T. C. Anstey, 4, Elm-court

SCOTLAND.  
 53 MEMBERS.

*Aberdeen.*—Capt. Fordyce, Cox's-hotel, Jermyn-street  
*Aberdeenshire.*—Hon. W. Gordon, Argyle-house, Argyle-street  
*St. Andrew's.*—E. Ellice, jun., 18, Arlington-street  
*Argyllshire.*—Rt. Hon. D. McNeill, Carlton-club  
*Ayr.*—Lord P. C. Stuart, 6, Whitehall-pl.  
*Ayrshire.*—A. Oswald, 14, Arlington-st.  
*Banffshire.*—James Duff  
*Berwickshire.*—Hon. Francis Scott, Carlton-club  
*Buteshire.*—Hon. J. S. Wortley, 29, Berkeley-square  
*Caitness-shire.*—G. Traill, Steven's-hotel, Bond-street  
*Clackmannanshire.*—Maj.-Gen. Morison, 16, Saville-row  
*Dumbartonshire.*—A. Smollett, 1, St. Alban's-place  
*Dumfries.*—Wm. Ewart, 6, Cam.-square, Hyde-park  
*Dumfriesshire.*—Visct. Drumlanrig, 2, George-street  
*Dundee.*—G. Duncan, 6, Belgrave-st., South  
*Edinburgh.*—W. G. Craig, 22, Lowndes-square. C. Cowan, 45, Upper Thames-street  
*Edinburghshire.*—Sir J. Hope, 1, St. Alban's-place  
*Elgin.*—G. S. Duff, 130, Piccadilly  
*Elginshire.*—C. L. C. Bruce, 1, St. Alban's place  
*Falkirk.*—Earl of Lincoln  
*Fife-shire.*—I. Fergus, 11, Hereford-st.  
*Forfarshire.*—Ld. J. F. Hallyburton, Kensington-palace  
*Glasgow.*—J. MacGregor, Ennismore-terrace. A. Hastie  
*Greenock.*—Lord Melgund, 48, Eaton-sq.  
*Haddington.*—Sir H. R. Davie, 48, Wilton-crescent  
*Haddingtonshire.*—Hon. F. Charteris, 27, Chesham-street

- Inverness-shire*.—H. J. Baillie, jun., 1, Seamore-place  
*Inverness*.—A. Matheson, Orient. and Ref. clubs  
*Kilmarnock*.—Hon. E. P. Bouverie, 19, Chester-street  
*Kincardineshire*.—Hon. Lt.-Gen. Arbuthnot, 5 B, Albany  
*Kirkaldy*.—Lieut.-Colonel Ferguson, Brooke's-club  
*Kircudbright*.—J. Macgill  
*Lanarkshire*.—W. Lockhart, Carlton-club  
*Leith*.—Rt. Hon. A. Rutherford, Gwydir-house  
*Linlithgowshire*.—G. Dundas, 26, Pall Mall  
*Montrose*.—J. Hume, 6, Bryanstone-sq.  
*Orkney and Shetland*.—A. Anderson, 122, Leadenhall-street  
*Paisley*.—A. Hastie, 5, Rutland-gate  
*Peeblesshire*.—W. F. Mackenzie, Carlton-club
- Perth*.—Rt. Hon. F. Maule, 38, Lower Grosvenor-street  
*Perthshire*.—H. H. Drummond, Carlton-club  
*Renfrewshire*.—Col. Mure  
*Ross and Cromarty*.—J. Matheson, 13, Cleveland-row  
*Roxburghshire*.—Hon. J. E. Elliott, 41, Wilton-crescent  
*Selkirkshire*.—A. E. Lockhart, Carlton-club  
*Stirling*.—J. B. Smith, 105, Westbourne-terrace  
*Stirlingshire*.—W. Forbes, Carlton-club  
*Sutherlandshire*.—Sir D. Dundas, 13, King's-bench-walk  
*Wick*.—J. Loch, 12, Albemarle-street  
*Wigton*.—Sir J. M'Taggart, Portland-club  
*Wigtonshire*.—Capt. J. Dalrymple, 30, Albemarle-street

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## CLERKS AND OFFICERS OF BOTH HOUSES OF PARLIAMENT.

### PEERS.

- Speaker*.—Ld. Cottenham (Ld. Chancel.)  
*Speakers by Royal Com.*—Earl of Shaftesbury (Chairman of Committee), Lord Denman  
*Gent. Usher of Black Rod*.—Sir A. W. Clifford, Bart.  
*Serj. at Arms*.—Lt.-Col. A. Perceval  
*Clerk of Parl.*—Rt. Hon. Sir G. H. Rose
- Clerk Assist.*—J. G. S. Lefevre  
*Add. Clerk Assist.*—W. Rose  
*Reading Clerk and Clerk of Priv. Com.*—L. Edmunds  
*Counsel to Chairman of Com.*—R. Palk  
*Clerk of Journals*.—Edward Parratt  
*Chief Clerk*.—H. S. Smith  
*Librarian*.—J. F. Leary

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### COMMONS.

- Serj. at Arms*.—Lord C. J. F. Russell  
*Chief Clerk*.—J. H. Ley  
*Clerk Assistant*.—W. Ley  
*Chaplain*.—Rev. T. Garnier
- Librarian*.—T. Vardon, Ass. Hon. G. Waldegrave  
*Sec. to Speak.*—C. E. Lefroy
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HER MAJESTY'S CHIEF OFFICERS OF STATE.

First Lord of the Treasury .. ..	Right Hon. Lord J. Russell
Lord High Chancellor .. ..	Right Hon. Lord Cottenham
Chancellor of the Exchequer .. ..	Right Hon. Sir C. Wood, Bart.
Lord President of the Council .. ..	Right Hon. Marquis of Lansdowne
Lord Privy Seal .. ..	Right Hon. Earl Minto
Secretary of State, Home Department..	Right Hon. Sir G. Grey, Bart.
Secretary of State, Foreign Affairs ..	Right Hon. Viscount Palmerston
Secretary of State for the Colonies ..	Right Hon. Earl Grey
First Lord of the Admiralty .. ..	Right Hon. F. T. Baring
President of the Board of Control .. ..	Right Hon. Sir J. C. Hobhouse, Bart.
President of the Board of Trade .. ..	Right Hon. H. Labouchere
Paymaster-General .. ..	Right Hon. Earl Granville
Postmaster-General .. ..	Right Hon. Marquis of Clanricarde
First Commissioner of Woods & Forests..	Right Hon. Lord Seymour
Chancellor of the Duchy of Lancaster ..	Right Hon. Earl Carlisle

*The above form the Cabinet.*

Commander-in-Chief .. ..	His Grace the Duke of Wellington
Secretary at War .. ..	Right Hon. F. Maule
Master-General of the Ordnance..	Marquis of Anglesey
Master of the Mint .. ..	Right Hon. R. L. Shiel, M.P.
Advocate-General .. ..	Right Hon. Sir D. Dundas
Secretary to Board of Control .. ..	James Wilson, M.P.
Surveyor-General of the Ordnance ..	Maj.-Gen. C. R. Fox
Clerk of the Ordnance .. ..	Col. Hon. G. Anson, M.P.
Storekeeper of the Ordnance .. ..	Capt. Sir T. Hastings
Under Secretary of State, Colonies ..	B. Hawes, M.P.
Under Secretary of State, Foreign ..	Lord Eddisbury
Under Secretary of State, Home..	H. Waddington
Joint Secretaries to Treasury .. ..	Rt. Hon. W. C. Hayter ; H. Tuffnell
Secretary to the Admiralty .. ..	J. Parker, M.P.
Attorney-General .. ..	Sir J. Jervis, M.P.
Solicitor-General .. ..	Sir J. Romilly, M.P.
Lord Lieutenant of Ireland .. ..	Right Hon. the Earl of Clarendon
Chief Secretary .. ..	Sir W. M. Somerville, Bart.
Lord Chancellor .. ..	Right Hon. M. Brady
Lord Advocate for Scotland .. ..	Right Hon. A. Rutherford, M.P.
Solicitor-General... ..	

TREASURY.

*Lords Commissioners.*—Rt. Hon. Lord J. Russell ; Rt. Hon. Sir C. Wood, Bt. ; R. M. Bellew ; H. Rich ; W. G. Craig  
*Joint Secs.*—H. Tuffnell ; W. C. Hayter  
*Principal Clerk.*—S. R. M. Leake  
*Solicitor.*—G. Maule  
*Accountant.*—J. Miller

PRIVY COUNCIL.

*Clerks in Ord.*—C. C. F. Greville ; Hon. W. Bathurst  
*Chief Clerk.*—J. B. Lennard  
*Appeal Clerk.*—H. Reeve  
*Clk. for Cler. Returns.*—Rev. W. Harness, M.A.

EXCHEQUER.

*Comptroller.*—Lord Montague  
*Chief Clerk.*—F. P. Ottey  
*Accountant.*—G. F. Froderick

COLONIAL OFFICE.

*Under Secs.*—B. Hawes ; H. Merrivale, T. F. Elliott, *Assistant*  
*Chief Clerk.*—P. Smith

FOREIGN OFFICE.

*Under Secs.*—Lord Eddisbury ; H. W. Addington  
*Chief Clerk.*—G. L. Conyngham

WOODS AND FORESTS.

*Commissioners.*—Rt. Hon. Earl of Carlisle ; A. Milne ; Hon. C. A. Gore  
*Chief Clerks.*—G. Cornell ; J. Burke

BOARD OF TRADE.

*Vice-Pres.*—Earl Granville  
*Direct. Statis. Dep.*—A. Fonblanque ;  
*Deputies.*—W. D. Oswald, R. Valpy  
*Secs.*—G. R. Porter ; Sir D. le Marchant, Bt.

## BOARD OF CONTROL.

*Pres.*—Sir J. C. Hobhouse*Secs.*—Hon. J. E. Elliott; J. Wilson

## HOME OFFICE.

*Und. Secs.*—H. Waddington; G. C. Lewis*Chief Clerk.*—H. J. Knyvett

## QUEEN'S MINT.

*Mast. Work.*—R. L. Sheil*Comptroller.*—J. Tekell*Chief Medallist.*—B. Pistrucchi*Assayer.*—H. Bingley

## STATE PAPER OFFICE.

*Keeper.*—Right Hon. H. Hobhouse*Chief Clerk.*—R. Lemon

## CUSTOMS.

*Commissioners.*—Sir T. F. Fremantle, Bart. (Chairman); Rt. Hon. G. Dawson (Dep. Chairman); H. Richmond; S. G. Lushington; C. C. Smith; Hon. S. E. S. Rice; F. Goulbourn; T. P. Dickinson; Capt. Saurin*Sec.*—C. A. Scovell*Surv.-Gen.*—A. Ross; B. Jennings; C. Boyd; T. Howe*Inspec.-Gen.*—W. Irving

## INLAND REVENUE.

## EXCISE.

*Commissioners.*—J. Wood (Chairman); H. Davis (Dep. Chairman); T. Harrison; H. P. Stephenson; C. J. Herries; C. P. Rushworth; A. Montgometry; C. P. Pressly*Sec.*—J. C. Freeling

## STAMPS AND TAXES.

*Chief Clerk.*—T. Sargent*Solicitor.*—J. Timms

## IRISH OFFICE.

*Chief Sec.*—Sir W. Somerville, Bart.*Chief Clerk.*—G. Trundle

## RAILWAY COMMISSION.

*Commissioners.*—Rt. Hon. H. Labouchere (Chairman); Earl Granville; Rt. Hon. Sir E. Ryan*Sec.*—Capt. Harness, R.E.*Regist.*—D. M'Gregor

## GENERAL REGISTER OFFICE.

*Reg.-Gen.*—G. Graham*Chief Clerk.*—T. Mann*First Clerk of Records.*—E. Edwards

## DUCHY OF CORNWALL.

THE PRINCE OF WALES'S COUNCIL.  
His Royal Highness Prince Albert, K.G.

The Earl of Lincoln

The Right Hon. T. P. Leigh

Right Hon. the Earl of Carlisle

Lord Portman

*Sec.*—J. R. Gardiner

## OFFICERS.

*Lord Warden of Stan. & Chief Stew. of Duchy in Cornwall & Devon.*—H.R.H. Prince Albert*Sec. to L. W. & Keep. of Rec. of Duchy.*

—J. R. Gardiner

*Chanc. & Keep. of Gt. Seal.*—The Right Hon. T. P. Leigh*Surv.-Gen.*—J. R. Gardiner*Auditor.*—E. White*Rec.*—J. W. Bateman*Dep.-Rec.*—B. Tucker*Att.-Gen.*—The Hon. J. C. Talbot, Q.C.*Sol.-Gen.*—E. Smirke*Vice-Warden.*—J. L. Dampier*Sheriff of Cornwall.*—Sir Samuel Thomas Spry*Surv. of Land & Min. in Cornw. & Devon.*—R. Taylor*Surv. of Lands in Somerset, Dorset, & Wilts.*—R. Watt*Mineral Agent.*—R. Taylor*Rang. & Mast.-Forest of F. of Dartmoor.*—H.R.H. Prince Albert, K.G.

## DUCHY OF LANCASTER.

*Chanc.*—The Right Hon. Earl of Carlisle*Att.-Gen.*—T. F. Ellis*Rec.-Gen.*—Major-Gen. C. R. Fox, M.P.*Auditor.*—J. G. Lockhart*Clerk of Coun. & Regist.*—F. D. DanversCOMMITTEE OF PRIVY COUNCIL  
FOR TRADE.*Pres.*—Rt. Hon. the Earl of Clarendon, G.C.B.*Vice-Pres.*—Rt. Hon. Earl Granville*Committee.*—Lord Chancellor, First Lord of the Admiralty, the Principal Secretaries of State, Chancellor of the Exchequer, Speaker of the House of Commons, Chancellor of the Duchy of Lancaster, Paymaster-General, Master of the Mint, those Officers of State in Ireland who are Privy Counsellors in England, Bishop of London  
*Joint Secs.*—George R. Porter; Sir Dennis le Marchant

## PRIVY SEAL OFFICE.

*Lord Privy Seal.*—The Right Hon. the Earl Minto, G.C.B.*Patent Clerks.*—J. G. Donne; R. Eden*Clerk.*—W. Goodwin*Keep. of Rec. & Receiv. of Fees.*—R. Eden

## PUBLIC WORKS LOAN OFFICE.

Acts 57 Geo. III., cap. 34 &amp; 124—3 Geo. IV., cap. 86—1 &amp; 2 Wm. IV., cap. 24—4 &amp; 5 Wm. IV., cap. 72—1 Vict., cap. 51—1 &amp; 2 Vict., cap. 88, &amp; 3 Vict., cap. 10—5 Vict., Sess. 2, cap. 9.

*Chairman.*—B. Harrison*Dep. Chairman.*—G. Hathorn

C. Bosanquet; Earl Fortescue, P.C.;

Visc. Melbourne; Sir T. D. Acland,



Bart., M.P.; Sir T. S. Gooch, Bart.; Lord Hatherton, P.C.; T. G. B. Estcourt, M.P.; W. W. Whitmore; J. Loch; H. Warburton, M.P.; Sir B. Heywood, Bart.; Right Hon. H. Labouchere, M.P.; J. Thornton; J. Berens; S. M. Phillips; A. Colville; J. Olive; J. Reid; N. Garry; Sir J. H. Pelly, Bart.; J. H. Palmer; A. G. Roberts, jun.; T. Baring, M.P.; G. W. Norman; G. C. Glyn; S. J. Loyd; W. Ward; H. A. Harrison  
*Sec.*—J. S. Brickwood

**PUBLIC RECORD OFFICE.**

*Head Office.*—Rolls-house, Chancery-la.  
*Branch Office.*—Rolls chapel, Rolls-yd.; Tower; Chapter-house, Poets' Corner; and Carlton-ride. Office hours, 10 to 4.  
*Keep. & Custos of Rec.*—The Master of the Rolls  
*Dep.-Keep.*—Sir F. Palgrave, K.H.  
*Sec.*—F. S. Thomas

**COLONIAL LAND AND EMIGRATION BOARD.**

*Commissioners.*—T. W. C. Murdock; C. A. Wood; F. Rogers  
*Sec.*—S. Walcot

**ENCLOSURE COMMISSIONERS FOR ENGLAND & WALES.**

*Chief Com.*—Rt. Hon. Earl of Carlisle  
*Comms.*—G. Darby; W. Blamire  
*Sec.*—H. C. Mules

**ECCLESIASTICAL COMMISSIONERS FOR ENGLAND.**

The Archbishops and Bishops of England and Wales; the Lord Chancellor; First Lord of the Treasury; President of the Council; Secretary of State for the Home Department and Chancellor of the Exchequer; the Lord Chief Justices of England; the Master of the Rolls; the Lord Chief Justice of the Common Pleas, Lord Chief Baron, and the Judges of the Prerogative and Admiralty Courts; the Deans of Canterbury, St. Paul's, and Westminster; the Earls of Devon and Chichester; Right Hon. H. Goulburn, the Right Hon. H. Hobhouse; Right Hon. J. R. G. Graham, Bart., M.P.; J. G. S. Lefevre; J. Nicholl, D.C.L., M.P.

*Treas. & Secs.*—(Vacant).  
*Solicitors.*—Messrs. J. Meadows White & J. Murray  
*Assist.-Sec.*—J. J. Chalk  
*Architect.*—W. Railton  
*Survs.*—Messrs. R. Cluton, J. Pickering, & Smith  
*Aud. & Act.*—A. Morgan  
*Accountant.*—B. R. Aston  
*Office-Keep. & Mess.*—J. Bubb

**EASTLAND COMPANY.**

*Governor.*—S. Thornton  
*Dep.-Gov.*—J. Cattley  
*Treas.*—Hon. J. T. L. Melville  
*Sec.*—T. Cope

**COMMISSIONERS FOR PROMOTING THE FINE ARTS.**

*Commissioners.*—H.R.H. Prince Albert, K.G.; Right Hon. Lord Lyndhurst; Right Hon. Duke of Sutherland, K.G.; Right Hon. Marquis of Lansdowne, K.G.; Right Hon. Earl of Lincoln, M.P.; Earl of Shrewsbury; Right Hon. Earl of Aberdeen, K.T.; Right Hon. Viscount Canning; Right Hon. Lord J. Russell, M.P.; Right Hon. Earl of Ellesmere; Right Hon. Earl of Carlisle; Right Hon. Viscount Palmerston, M.P.; Viscount Mahon, M.P.; Lord W. de Eresby; Lord Colborne; Right Hon. C. S. Lefevre, M.P.; Right Hon. Sir R. Peel, Bart., M.P., P.C.; Right Hon. Sir J. R. G. Graham, Bart, M.P., P.C.; Sir R. H. Inglis, Bart., M.P.; Right Hon. T. B. Macaulay, M.P.; B. Hawes, jun., M.P.; H. Hallam, F.R.S.; S. Rogers, F.R.S.; G. Vivian; T. Wyse  
*Sec.*—C. L. Eastlake, R.A.

**OFFICE OF REGISTRAR OF DESIGNS.**

*Regist.*—C. Johnson  
*Assist.-Regist.*—Hon. E. C. Curzon  
*Clerk.*—J. H. Bowen  
*Second Clerk.*—H. C. Woollett  
*Office-Keeper.*—C. Tristram  
*Mess.*—J. Pastell

**POST OFFICE (General).**

*Postmaster-Gen. for U. Kingdom.*—The Most Noble U. J. Marquis of Clanricarde, K.P.  
*Sec.*—Lieut.-Col. W. L. Maberley  
*Sec. to Postm.-Gen.*—R. Hill  
*Assist. Sec.*—J. Tilley  
*Inspect.-Gen.*—J. Ramsey  
*Priv. Sec. to Postm.-Gen.*—G. C. Cornwall  
*Chief Clerk to Sec.*—C. Johnson

**AUDIT OFFICE FOR PUBLIC ACCOUNTS.**

*Commissioners.*—Col. Sir W. L. Herries, C.B., K.C.H. (Chairman); H. F. Luttrell; H. Arbuthnott; E. Romilly; Sir A. G. Grant, Bart.; C. Ross; R. V. Davies.  
*Sec.*—R. M. Bromley

**ADMIRALTY.**

*Commissioners.*—Sir F. Baring, Admiral Dundas, Adm. Berkeley, Capt. Milne, Hon. W. Cowper  
*Secretaries.*—J. Parker, Capt. W. A. Hamilton  
*Hydrographer.*—Rear-Adm. Sir F. Beaufort

## ARCHITECTURAL AND ENGINEERING WORKS.

*Director.*—Lieut.-Col. A. Irvine, C.B.  
*Chief Assist.*—W. Scamp

## WAR-OFFICE.

*Commander-in-Chief.*—D. of Wellington  
*Sec. to Com.-in-Chief.*—Lord Fitzroy Somerset  
*Secretary at War.*—Hon. F. Maule  
*Dep.*—L. Sullivan

## ROYAL OBSERVATORY, GREENWICH.

*Astron. Royal & Sup. of Chronometers.*—  
 G. B. Airy, M.A., F.R.S.  
*First Assist.*—Rev. R. Main, M.A.  
*Sup. of Naut. Almanack.*—Lieut. W. S. Stratford, R.N.

## SOUTH-SEA COMPANY.

*Governor.*—C. Bosanquet  
*Sub-Gov.*—C. Franks  
*Dep.-Gov.*—Hon. P. P. Bouverie  
*Cashier.*—J. T. Viner  
*Sec.*—C. F. Gibson  
*Accountant.*—W. R. Arnold

## COMMISSIONERS FOR THE REGISTRATION AND REGULATION OF COAL-WHIPPERS IN THE PORT OF LONDON.

[Under the Act 9 & 10 Vict., c. 36.]

*Commiss. app. by Lords of Com. of Privy Coun. for Trade.*—C. Green (Chairman); R. Gamman; V. H. Hobart; T. Wood  
*Commiss. app. by Com. Council of City of London.*—T. Pewtress (Vice-Chair.); J. Dixon; G. Stacey; T. Snelling  
*Commiss. in Term. of Act.*—G. F. Young  
*Regist.*—J. Barber

## INCORPORATED LAW SOCIETY.

*Pres.*—B. Austen  
*Vice-Pres.*—T. Clarke  
*Sec.*—R. Maughan

## SOCIETY FOR PROTECTION OF AGRICULTURE.

*Pres.*—The Duke of Richmond  
*Vice-Pres.*—The Duke of Buckingham  
*Sec.*—H. Dyson

## DIRECTORS OF THE EAST-INDIA COMPANY, 1850.

John Shepherd, *Chairman.*

Sir J. W. Hogg, Bart., M.P., *Dep. Chairman.*

W. Wigram  
 Sir R. Campbell, Bart.  
 J. Masterman, M.P.  
 J. P. Muspratt  
 H. Alexander  
 Lt.-Gen. Sir J. L. Lushington, G.C.B.  
 G. Lyall  
 R. Ellice

Sir R. Jenkins, G.C.B.  
 W. B. Bayley  
 F. Warden  
 Sir H. Willock, K.L.S.  
 M. T. Smith, M.P.  
 Lieut.-Col. W. H. Sykes  
 E. Macnaghten  
 Major J. Oliphant

J. C. Whiteman  
 The Hon. W. H. L. Melville  
 R. D. Mangles, M.P.  
 Major-Gen. J. Caulfield, C.B.  
 W. J. Eastwick  
 Major J. A. Moore

The following gentlemen are out by rotation:—J. Cotton; J. Loch; C. Mills; W. H. C. Plowden, M.P.; H. Shank; H. St. G. Tucker.

## GOVERNORS AND DIRECTORS OF THE BANK OF ENGLAND.

*Governor.*—H. J. Prescott.

*Dep.-Gov.*—Thomas Hankey.

H. H. Berens  
 A. E. Campbell  
 E. H. Chapman  
 W. Cotton  
 R. W. Crawford  
 B. Dobree

B. D. Greene  
 C. P. Grenfell  
 J. O. Hanson  
 J. B. Heath  
 K. D. Hodgson  
 H. L. Holland

J. G. Hubbard  
 T. N. Hunt  
 C. F. Hutt  
 A. Lathan  
 J. Malcolmson  
 J. Morris

S. Neave  
 G. W. Norman  
 J. H. Palmer  
 Sir J. H. Pelly, Bt.  
 W. Thompson, Ald.  
 T. Tooke, jun.

*Sec.*—J. Knight.

*Chief Accountant.*—W. Smee.

LONDON BANKERS.

Agra and United Service Bank, 15, Old Jewry-chambers  
 Bank of Australasia, 8, Austin Friars  
 Bank of Australia, 2, Moorgate-street  
 Bank of Ceylon, 32, New Bond-street  
 Bank of British North America, 7, St. Helen's  
 Bank of England  
 Barclay, Bevan, Tritton, & Co., 54, Lombard-street  
 Barnard, Dimsdale, & Co., 50, Cornhill  
 Barnett, Hoare, Hoare, & Bradshaw, 62, Lombard-street  
 Biggerstaff, W. & J. S., West Smithfield  
 Bosanquet, Anderson, Franks, & Co., 73, Lombard-street  
 Bouverie & Co., 11, Haymarket  
 British Colonial Bank and Loan Comp., 50, Moorgate-street  
 Brown, Janson, & Co., 32, Abchurch-la.  
 Bult, Son, & Co., 85 & 86, Cheapside  
 Call, Sir W. P., Bart., Martin, & Co., 25, Old Bond-street  
 Child & Co., 1, Fleet-street  
 Cocks, Biddulph, & Biddulph, 43, Charing-cross  
 Cockburn & Co., 4, Whitehall  
 Colonial Bank, 13, Bishopsgate-st.-within  
 Commercial Bank of London, Lothbury  
 Conliffe, Roger, 24, Bucklersbury  
 Cunliffe, Brooks, & Co., 29, Lombard-st.  
 Curries & Co., 29, Cornhill  
 Davies, R., & Co., 187, Shoreditch  
 Dixon, Brooks, & Dixon, 25, Chancery-lane  
 Denison, Heywood, & Co., 4, Lombard-street  
 Drewett & Fowler, 4, Princes-st., Bank  
 Drummond & Co., 49, Charing-cross  
 Feltham, J., & Co., 42, Lombard-street  
 Fuller & Co., 66, Moorgate-street  
 Glyn, Sir R. C., & Co., 67, Lombard-st.  
 Goslings & Co., 19, Fleet-street  
 Hanbury, Taylor, & Lloyd, 60, Lombard-street  
 Hankey & Co., 7, Fenchurch-street  
 Herries, Farquhar, & Co., 16, St. James's-street  
 Hill & Sons, 17, West Smithfield  
 Hoare, Messrs., 37, Fleet-street  
 Hopkinson & Co., 3, Regent-st., Waterloo-place  
 Ionian Bank, 6, Great Winchester-st.  
 Johnston, H. & J., & Co., 15, Bush-lane, Cannon-street  
 Jones, Loyd, & Co., 43, Lothbury  
 London & County Joint Stock Banking Co., 21, Lombard-street

London Joint Stock Bank, 5, Princes-st., Bank; 69, Pall Mall  
 London & Westminster Bank, 38, Lothbury; St. James's-square; 213 & 214, High Holborn; Wellington-street, Borough; 87, High-street, Whitechapel; 4, Stratford-place  
 Lubbock, Sir J. W., Bart., & Co., 11, Mansion-house-street  
 Martin, Stone, Martin, & Co., 68, Lombard-street  
 Masterman, Peters, & Co., 35, Nicholas-lane  
 National Bank of Ireland, 13, Old Broad-street  
 National Provincial Bank of England, 112, Bishopsgate-street-within  
 North-Western Bank of India, 19, King's Arms-yard, Moorgate-street  
 Oriental, 7, Walbrook  
 Pocklington & Lacey, 60, W. Smithfield  
 Praed, Fane, Praed, Johnstone, & Co., 189, Fleet-street  
 Prescott, Grote, & Co., 62, Threadneedle-street  
 Price, Sir C., Bart., & Co., 3, King William-street  
 Provincial Bank of Ireland, 42, Broad-st.  
 Puget, Bainbridge, & Co., St. Paul's-churchyard  
 Ransom & Co., 1, Pall Mall East  
 Roberts, Curtis, & Co., 15, Lombard-st.  
 Rogers, Olding, & Co., 29, Clement's-la.  
 Royal Bank of Australia, 2, Moorgate-st.  
 Sapte, Banbury, Muspratt, & Co., 77, Lombard-street  
 Scott, Sir S., Bart., & Co., 1, Cavendish-square  
 Shank, J., 76, West Smithfield  
 Smith, Payne, & Smith, 1, Lombard-street  
 South Australian Banking Co., 54, Old Broad-street  
 Spooner, Attwoods, & Co., 27, Gracechurch-street  
 Stevenson, Salt, & Sons, 20, Lombard-street  
 Stride, J. & W. S., 41, West Smithfield  
 Strahan, W. & P., Sir J. D., Bart., Temple-bar-without, 217, Strand  
 Tisdall, T. G., 15, West Smithfield  
 Twining, R. G., J. A., & R., 215, Strand  
 Union Bank of Australia  
 Union Bank of London, 2, Princes-st., Bank; Argyll-place; 4, Pall Mall East  
 Williams, Deacon, Labouchere, & Co., 20, Birchin-lane  
 Willis, Percival, & Co., 76, Lombard-st.

## CITY OFFICES.

## LORD MAYOR.

The Right Hon. T. Farncomb. .... 1840

## SHERIFFS.

D. Nicoll; W. Laurence

## UNDER SHERIFFS.

T. Millward; D. W. Wire.

## ALDERMEN.

*The following have not passed the Chair.*

Chosen

Musgrove, J., 18, Old Broad-st. .. 1842

Hunter, W., 10, Finsbury-circus .. 1843

Challis, T., 32, Wilson-street .. 1843

Sidney, T., M.P., 8, Ludgate-hill .. 1844

Moon, F. G., 20, Threadneedle-st.. 1844

Salomons, D., 1, Shorter's-court .. 1848

Finnis, T. Q., Tower-street..... 1848

Lawrence, W., 30, Bread-street. .... 1848

Carden, R. W., 2, Exchange-bldgs. 1849

*Recorder.*—Hon. C. E. Law.*Chamberlain.*—A. Browne.*The following have passed the Chair.*

Chosen

Hunter, Sir C. S., Bart., 23, Euston-sq. 1804

Thompson, W., M.P., Up. Thames-st. 1821

Key, Sir J., Bart., 3, Abchurch-la... 1823

Laurie, Sir P., Kt., 7, Park-square.. 1826

Farebrother, C., 6, Lancaster-place 1826

Copeland, W., M.P., 37, Linc.-inn-fld. 1830

Kelly, T., 17, Paternoster-row .... 1830

Wilson, S., 24, St. Paul's-churchyd. 1831

Marshall, Sir C., Kt., 43, Russell-sq. 1832

Pirie, Sir J., Bart., Birchin-lane .. 1834

Humphery, J., M.P., Hay's-wharf.. 1835

Magnay, Sir W., Bart., College-hill 1838

Gibbs, M., 33, Walbrook .. 1838

Carroll, Sir G., 34, Cavendish-sq... 1840

Hooper, J. K. .... 1840

Duke, Sir J., M.P. .... 1840

*Town Clerk.*—Serjt. Merewether.*Common Serjeant.*—J. Bullock.

## BRITISH AND FOREIGN AMBASSADORS.

<i>Country.</i>	<i>British Ministers abroad.</i>	<i>Secretaries of Legation.</i>	<i>Foreign Ambassadors.</i>	<i>Secretaries of Legation.</i>
America....	Hon. Sir H. Bulwer	J. F. Crampton.	A. Lawrence.	J. C. Davis
Austria ....	Visc. Ponsonby.	A. C. Magenis.	Baron Koller.	Ct. Colledero
Bavaria ....	J. B. Milbanke.	A. G. Bonar.	Baron de Cetto.	
Belgium....	Ld. H. de Walden.	T. W. Waller.	S. Van de Weyer.	C. Drouet
Brazil.....	Lord Howden.	J. Hudson.	Marq. de Lisboa.	A. de Paiva
Denmark ..	Rt. Hon. H. W. W. Wynn.	P. Browne.	Ct. de Reventlow.	M. Bielke
France ....	Marq. Normanby.		M. Drouyhn de	
Germn. Con.	Lord Cowley.		[l'Huys.	
Greece ....	Mr. T. Wyse.	P. Griffith.		
Hanseatic T.	G. L. Hodges.		J. Colquhoun.	[mann
Hanover ..	Hon. J. D. Bligh.	Hn. G. Edgcumbe	Ct. Kielmansege	C. Klinge-
Mexico ....	C. Bankhead.	P. W. Doyle.	Don J. M. Mora.	Don J'Mndoza
Netherlands	Sir E. Disbrowe.	Hon. H. Elliott.	Ct. Schimmelpenninck.	J. L. A. Stratenus
N. Granada	D. F. O'Leary.		M. M. Mosquera.	Don Rde Alaya
Portugal ..	Sir G. Seymour.	Hn. H. G. Howard	Vis. de Moncorvo.	Cy M. Ribeiro
Prussia ....	E. of Westmorland.	H. F. Howard.	Chev. Bunsen.	C. P. Seidlitz
La Plata ....	H. Southern.	F. L. Hall.	Don M. Moreno.	[nitz
Russia ....	Lord Bloomfield.	A. Buchanan.	B. de Brunnow.	Ct. de Berg
Sardinia....	Hn. R. Abercrombie	Hon. R. Bingham	Baron d'Isola.	M. de Azeglio
Saxony ....	Hon. F. Forbes.	C. T. Barnard.		
Sicilies, Two	Hon. W. Temple.	Lord Napier.	Pr. Castelcicala.	Sig. Conofar.
Spain .....				
Sweden ....		G. R. Gordon.	Baron Rehausen.	G. Sibbern.
Switzerland	Sir E. Lyons.	R. Peel.		
Turkey ....	Sir S. Canning.	Hn. G. Jerningham.	Pr. Callimaki.	
Tuscany....	Sir G. B. Hamilton.	Hn. P. C. Scarlett.		
Wurtemberg.	Sir A. Malet.	A. Craven.		



# COLONIAL GOVERNORS.

<i>Colony.</i>	<i>Governor.</i>	<i>Secretary.</i>
Canada .. ..	Rt. Hon. Earl of Elgin and Kincardine	Lt.-Col. Hon. R. Bruce
Nova Scotia ..	Lt.-Gen. Sir J. Harvey, K.C.B.	Capt. Thos. Bourke
New Brunswick ..	Sir E. W. Head, Bart. .. ..	G. Botsford
Pr. Edward's Island	Sir D. Campbell, Bart. .. ..	T. H. Haviland
Newfoundland ..	Sir J. G. le Marchant .. ..	J. Crowdey
Barbadoes .. ..	Colonel Sir W. M. G. Colebrooke	J. Walker
Grenada .. ..	Ker B. Hamilton .. ..	O. Rowley
St. Vincent .. ..	Sir J. Campbell, Bart. .. ..	J. Beresford
Tobago .. ..	Major L. Graeme .. ..	J. Thornton
St. Lucia .. ..	C. H. Darling .. ..	W. Hanley
Trinidad .. ..	Lord Harris .. ..	A. White
Antigua .. ..	J. M. Higginson .. ..	T. Lane
Montserrat .. ..	E. D. Baynes .. ..	H. Loving
Nevis .. ..	W. Shortland .. ..	T. Slater
St. Kitt's .. ..	R. J. Mackintosh .. ..	R. M. Rumsey
Dominica .. ..	Lieut.-Col. G. Macdonald .. ..	W. A. McCoy
Jamaica .. ..	Rt. Hon. Sir C. E. Grey .. ..	W. G. Stewart
Heligoland .. ..	Capt. J. Hindmarsh, R.N. .. ..	
Honduras .. ..	Col. Fancourt .. ..	G. C. Berkeley
British Guiana ..	H. Barkley .. ..	W. Walker
Bahamas .. ..	J. Gregory .. ..	C. R. Nesbit
Bermuda .. ..	Capt. C. Elliott, R.N. .. ..	R. Kennedy
Cape of Good Hope	Maj.-Gen. Sir H. Smith .. ..	Capt. Maydwell
Ceylon .. ..	Viscount Torrington .. ..	Sir J. E. Tennant
Gibraltar .. ..	Sir R. W. Gardiner .. ..	G. Adderley
Hong Kong .. ..	S. G. Bonham .. ..	Major W. Caine
Malta .. ..	R. M. O'Ferrall .. ..	H. Lushington
Mauritius .. ..	Sir G. W. Anderson .. ..	C. E. Macaulay
New South Wales ..	Sir C. A. Fitzroy .. ..	E. D. Thomson
St. Helena .. ..	Maj.-Gen. Sir P. Ross, G.C.M.G., K.C.H.	R. C. Pennell
Sierra Leone .. ..	N. W. Macdownell .. ..	W. Ferguson
River Gambia .. ..	R. G. Macdonel .. ..	T. L. Ingram
Van Diemen's Land	Capt. Sir W. T. Denison, R.E. ..	J. E. Bicheno
West Australia .. ..	C. Fitzgerald .. ..	A. R. Madden
South Australia ..	Sir H. E. F. Young .. ..	Capt. C. Sturt
New Zealand .. ..	Sir G. Grey .. ..	Dr. Sinclair
Falkland Islands ..	G. Rennie .. ..	
Ionian Islands .. ..	Sir H. G. Ward .. ..	J. Fraser
Virgin Island.—E. H. D. Hay		Gold Coast.—Sir W. Winniett
Labuan.—Sir J. Brooke		Natal.—M. West

## PASSPORT AND CONSULAR OFFICES.

Austria.—Embassy, 7, Chandos-street  
 Baden.—Consul's-office, 1, Riches-ct.  
 Bavaria.—33½, Great St. Helen's  
 Belgium.—Consul's-office, 3, Copthall-ct.  
 Brazil.—41, York-street, Portman-sq.  
 Denmark.—Consul's-of., 6, Warnford-ct.  
 Equador Straits.—10, Old Jewry-cham.  
 France.—Consul's-of., 3, Copthall-bldgs.  
 Frankfurt.—12, Broad-street-buildings  
 Greece.—Consul's-of., 25, Finsbury-circ.  
 Hanover.—Embassy, 44, Grosvenor-pl.  
 Hanseatic Towns.—Consul's-office, 3, Hare-court, Temple  
 Hesse.—106, Fenchurch-street  
 La Plata.—27, New Broad-street  
 Mecklenburg.—Consul's-of., 9, Billiter-street  
 Mexico.—6, Arundel-street, Haymarket  
 Naples and Sicily.—15, Princes-street, Cavendish-square  
 Netherlands.—Consul's-of., 123, Fenchurch-street

New Granada.—3, Winchester-bldgs.  
 Oldenburg.—Consul's-office, 3, Hare-court, Temple  
 Peru.—6, Copthall-court  
 Portugal.—Consul's-of., 5, Jefferey-sq.  
 Prussia.—Consul's-office, 106, Fenchurch-street  
 Russia.—Consul's-office, 2, Winchester-buildings  
 Sardinia.—Consul's-of., 31, Old Jewry  
 Saxony.—3, Hare-court, Temple  
 Sicilies, the Two.—5, Princes-street, Cavendish-square  
 Spain.—Consul's-office, 37, Old Broad-st.  
 Sweden and Norway.—14, Halkin-st., Belgrave-square  
 Switzerland.—Consul's-office, 24A, Cat-eaton-street  
 Turkey.—Consulate, 1, Bryanstone-sq.  
 Tuscany.—Consul's-office, 15, Angel-ct.  
 Wurtemberg.—106, Fenchurch-street

## COURTS OF LAW.

## England.

## COURT OF CHANCERY.

*Lord High Chan.*—Rt. Hon. Lord Cottonham

*Chief Sec.*—C. Romilly

*Sec. of Bankrupts.*—W. Vizard

*Mast. of Rolls.*—Lord Langdale

*Chief Sec.*—G. W. Sanders

*Vice-Chan. of England.*—Rt. Hon. Sir L. Shadwell

*Vice-Chans.*—Right Hon. Sir J. L. Kt. Bruce; Right Hon. Sir J. Wigram

*Ac.-Gen.*—W. Russell

## QUEEN'S BENCH.

*Lord Chief Justice.*—Lord Campbell

*Judges.*—Sir J. Patteson; Sir J. T. Coleridge; Sir W. Wightman; and Sir W. Erle

## COMMON PLEAS.

*Lord Chief Justice.*—Right Hon. Sir T. Wilde

*Judges.*—Sir W. H. Maule; Sir C. Cresswell; Sir V. Williams; and Sir T. N. Talfourd

## EXCHEQUER.

*Lord Chief Baron.*—Right Hon. Sir F. Pollock

*Barons.*—Right Hon. Sir J. Parke; Sir E. H. Alderson; Sir R. M. Rolfe; Sir T. J. Platt.

*Cursitor Baron.*—G. Banks

## LAW OFFICERS.

*Att.-Gen.*—Sir J. Jervis, M.P.

*Sol.-Gen.*—Sir J. Romilly, M.P.

## COURT OF BANKRUPTCY.

*Chief Judge.*—Vice-Chan. Bruce

*Chief Regist.*—Mr. Serj. E. Lawes

*Commissioners.*—J. Evans; J. S. M. Fonblanque; R. G. C. Fane; E. Holroyd; Mr. Serj. Goulburn; H. J. Shepherd

## INSOLVENT DEBTORS' COURT.

*Chief Commis.*—H. R. Reynolds

*Commissioners.*—J. G. Harris; W. J. Law; and C. Phillips

## Ireland.

## 'COURT OF CHANCERY.

*Lord Chan.*—Rt. Hon. M. Brady

*Sec.*—F. W. Brady

*Mast. of Rolls.*—Rt. Hon. T. B. Smith

## COURT OF QUEEN'S BENCH.

*Lord Chief Just.*—Rt. Hon. F. Blackburne

*Judges.*—Hon. P. C. Crampton; Right Hon. L. Perrin; Rt. Hon. R. Moore

## COURT OF COMMON PLEAS.

*Lord Chief Justice.*—Rt. Hon. J. Doherty

*Judges.*—R. Torrens; Rt. Hon. N. Ball; J. D. Jackson

## COURT OF EXCHEQUER.

*Lord Chief Baron.*—Right Hon. D. R. Pigot

*Barons.*—R. Pennefather; Rt. Hon. J. Richards; Right Hon. T. Lefroy

## INSOLVENT DEBTORS' COURT.

*Commissioners.*—R. Farrel, Q.C., and W. H. Curran

*Chief Clerk.*—J. T. Lloyd

## BANKRUPTCY COURT.

*Commissioners.*—J. Macan, Q.C., and Hon. P. Plunket

*Registers.*—B. Collins and T. Batley

## LAW OFFICERS.

*Att.-Gen.*—J. M. Monahan

*Sol.-Gen.*—J. Hatchell

*Serjeants.*—J. Stock, LL.D., M.P.; J. Howley, Q.C.; and J. O'Brien

## PUBLIC OFFICES.

Audit Office for Public Accounts, Somerset-house

Board of Control for East-India affairs, Cannon-row, Westminster

Board of Trade, Whitehall

Board of Works, consol. with Commiss. of Woods & Forests and Land Revenue

Chancellor of Exchequer, 11, Downing-st.

City Solicitor's Office, Guildhall

Coal Exchange, Lower Thames-street

Colonial Land and Emigration Board, 15, Park-street

Colonial Office, Downing-street

Commissioners of Railways, Whitehall

Commissioners of Sewers for City of London, Guildhall-yard

Corn Exchange, Mark-lane

Council Office, Whitehall

Custom-house, Lower Thames-street

Designs Office, 4, Somerset-place

Duchy of Cornwall Office, Somerset-ho.

Duchy of Lancaster Office, Lancaster-place, Waterloo-bridge

East-India House, Leadenhall-street

Education, Commissioners for, Whitehall

Enrolment Office, Chancery-lane

Factories' Inspectors' Office, Bd. of Trade

Foreign Office, 15 and 16, Downing-st.

Gazette Office, Cannon-row  
Grand Junction Canal Office, Surrey-st.,  
Strand  
Home Office, Whitehall  
Irish Office, 18, Gt. Queen-st., Westmr.  
Lord Chamberlain's Office, Stable-yard  
Lord Chancellor's Office, Quality-court  
Lord Mayor's Court Office, 7, Old Jewry

Patent Bill Office, 13, Serle-street, Lin-  
coln's-inn  
Post Office, St. Martin's-le-Grand  
School of Design, Somerset-house  
Society for Diffusion of Useful Know-  
ledge, 42, Bedford-square  
State Paper Office, 12, Duke-st., Westmr.  
Stock Exchange, Capel-court, Bank

## UNIVERSITIES.

### OXFORD.

*Chancellor.*—Duke of Wellington, D.C.L.,  
&c.  
*High Steward.*—Earl of Devon  
*Nat. Philos.*—Rev. G. L. Cooke, B.D.  
*Exper. Philosophy.*—Rev. R. Walker,  
M.A., Wadham  
*Aldrich's Chemistry.*—C. G. B. Daubeny,  
M.D., F.R.S.  
*Mineralogy & Geology.*—W. Buckland,  
D.D., F.R.S.

### CAMBRIDGE.

*Chancellor.*—His Royal Highness Prince  
Albert, LL.D.  
*High Steward.*—Lord Lyndhurst, LL.D.  
*Vice-Chancellor.*—J. Cartmell, D.D.  
*Chemistry.*—J. Cumming, M.A., F.R.S.  
*Mineralogy.*—W. H. Miller, M.A.  
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 Hall, H. 33, Abchurch-lane, City  
 Handasyde, W., & Co. 57, Cannon-st., City, and Emerson-street, Bankside  
 Harratt, C. 2, Royal Exchange-bldgs.  
 Hawks & Crawshay. 23, Upper Thames-street  
 Heath, J. M. 2, Winchester-buildings  
 Hitchcock, G. C. 2, Crosby-square, and Lloyd's  
 Hogarth, J. Hartley's-whf., Horsleydn.  
 Hood, T. & C. 18, Earl-street, Blackfriars  
 Hoole & Lockyer. 21, St. James's-walk, and 1, Suffolk-st., Clerkenwell  
 Johnson, Cammell, & Co. 19, Great George-street, Westminster  
 Jones, G. 27, Old Fish-street  
 Jones, J. 6, Bankside, Southwark, and Iron Bridge-wharf  
 Kelly, M. 31, Bankside  
 Kennard, R. W., & Co. 67, Upper Thames-street  
 Leadbetter & Moore. 5, Railway-place  
 Linley, T. 4, Carter-st., Walworth-rd.  
 London Vulcan Iron Works, St. Ann's-wharf, Blackfriars  
 Malins & Rawlinsons. 3, Mansion-house-place, and Millwall, Poplar

Mann, A. 28, Gloucester-terrace, Vauxhall-bridge-road  
 Manuel, E. 80, Cowcross-street  
 Mathews, W. B. 9, Crooked-lane, and 28, Martin's-lane, City  
 McLaren, Andrew, & Co. 14, 15, 19, 20, Steel-yard, Upper Thames-street  
 Morewood & Rogers (galvanized). 9, Steel-yard, 86, Upper Thames-street  
 Mortimer, H. H., & Co. 10 and 25, Great Bush-lane  
 Moser, Son, & Co. 165, Borough High-street  
 Moss, H., & Co. 3, Church-ct., Clement's-lane  
 Pace, Nephew, & Co. 3, Sherbourne-la.  
 Pfeil, A. L., & Co. 5 & 6, Broad-street, Bloomsbury  
 Pickering, T. 44, Narrow-st., Limeho.  
 Plumley, P. 42, New Park-st., Borough, and 5, Bankside  
 Pooley, A. G. 23, Billiter-street  
 Porter, J. Bridge-street, Southwark  
 Porter, J. H. 3, Mansion-house-street  
 Preller, C. A. 31, Abchurch-lane  
 Reid, A. 14, Fish-street-hill  
 Richards, T. S. & Co. 117 and 118, Bishopsgate Within, and at Birmingham  
 Rodman, S. 10, Vauxhall-bridge-road  
 Russell, J., & Co. 69, Up. Thames-st.  
 Sharpe, R. 22, Dowgate-hill  
 Smart, C. Phoenix-foundry, Coldbath-fields, and 369, Oxford-street  
 Smith, J. 29, Broad-street, Lambeth  
 Stainton, H. Carron Company, 15, Up. Thames-street  
 Starbuck, E. F. 2, Walbrook  
 Starling, W. D. 13, Change-alley  
 Stephenson, C., & Co. (hoop). 61, Gracechurch-street  
 Stunt, G. 11, Holland-st., Blackfriars-rd.  
 Swift, A. H. 21, Crosby-hall-chambers  
 Thompson & Co. Dyer's-hall-wharf, Upper Thames-street  
 Tiddeman & Co. Purfleet-wharf, Earl-street, Blackfriars  
 Tillet, G. 67, Hatton-garden  
 Treggon & Co. 22, Jewin-street, and 57, Gracechurch-street  
 Tuck, J. H. 22, Pall-mall  
 Tyler, Hayward, & Co. 85, Upper Whitecross-street  
 Tyrrell, R. Deptford-pier  
 Walker, G. 5, Pinners'-hall, Great Winchester-street  
 Walker, J. 52, Alfred-street, City-road  
 Walker & Holland. 121, Leadenhall-street, and Grange-road, Bermondsey  
 Walmsley & Co. 3, Upper Thames-st.  
 White, Lynch, & Co. 66, Bankside  
 Wilkie, G. 9, Steelyard, Up-Thames-st.  
 Williams, W. 10, Upper Thames-street  
 Wilson, W. G. St. Ann's-wharf, Earl-street, Blackfriars  
 Winter & Rich. 1, Bank-end, Park-st., and 7 & 8, Bankside

Woolcot, J. 6, Great Winchester-st.  
 Wright, E. 61, Wapping High-street  
 Wyatt, J. 2, Weymouth-place, New  
 Kent-road

## LIBRARIES.

Antiquarian Society. Somerset-house  
 Beaumont Philosophical Instit. Beau-  
 mont-square  
 Botanical Society. 20, Bedford-street  
 British Museum. Montague-place  
 Cadogan Institution. Sloane-street  
 Charterhouse. Charterhouse-square  
 Chelsea Hospital  
 City Library. Guildhall  
 Church Missionary College. 12, Barns-  
 bury-place  
 City of London Inst. 165, Aldersgate-st.  
 Clockmakers' Co. King's-head, Poultry  
 College of Advocates. Doctors'-coms.  
 College of Civil Engineers. Putney  
 College of Physicians. 13, Pall-mall East  
 College of Surgeons. 40, Lincoln's-inn-  
 fields  
 Congregational Library. 4, Blomfield-st.  
 Crosby Hall. Lit. and Scien. Inst. 32,  
 Bishopsgate Within  
 Dutch Church. Austinfriars (MSS.).  
 Eastern Lit. and Scien. Inst. Commer-  
 cial-road  
 Eastern Lit. and Scienc. Inst. 88, Hack-  
 ney-road  
 East-India House. Leadenhall-street  
 Geological Society. Somerset-house  
 Gray's-inn. South-square, Gray's-inn  
 Greenwich Hospital. Greenwich  
 Greenwich Institution. Greenwich  
 Guy's Hospital. St. Thomas's-st., Boro'  
 Hammersmith Instit. Hammersmith  
 Hebrew College. Duke's-place, Aldgate  
 Herald's Coll. Bennett's-hill, Doctors'-  
 commons  
 Highbury College. Higbury-park-house  
 Homerton College. Homerton  
 House of Lords. Westminster  
 House of Commons. Westminster  
 Incorporated Law Society. 106, Chan-  
 cery-lane  
 Inner Temple. 3, Tanfield-ct., Temple  
 Institution of Civil Engineers. 25, Great  
 George-street, Westminster  
 Islington Lit. and Sci. Inst. Wellington-  
 street, Upper-street  
 King's College. Somerset-house  
 Lambeth Palace. Lambeth  
 Lincoln's Inn New Hall. Lincoln's-inn  
 Linnean Society. 32, Soho-square  
 London Library. 12, St. James's-sq.  
 London Institut. 11 & 12, Finsbury-circ.  
 London Mechanics' Inst. 29, Southamp-  
 ton-buildings  
 Marylebone Institution. 17, Edwards-  
 street, Portman-square  
 Mathematical Soc. Church-st., Sptlflds  
 Medical Society. 3, Bolt-court, Fleet-st.  
 Merchant Taylors' School. 6, Suffolk-in.

Middle Temple. Garden-court, Temple  
 Poplar Institution. East-India-road  
 Royal Academy of Arts. Trafalgar-sq.  
 Royal Agricultural Soc. 12, Hanover-sq.  
 Royal Asiatic Society. 14, Grafton-st.  
 Royal Astronomical Soc. Somerset-ho.  
 Royal Geographical Soc. 3, Waterloo-pl.  
 Royal Institute of British Architects. 16,  
 Grosvenor-street  
 Royal Institution. 21, Albemarle-street  
 Royal Observatory. Greenwich  
 Royal Polytechnic Asso. 5, Cavendish-sq.  
 Royal Kensington Lit. and Sci. Inst.  
 Kensington  
 Royal Medical Society. 53, Berners-st.  
 Royal Society. Somerset-house  
 Royal Soc. of Literature. 4, St. Martin's-pl.  
 Russell Institution. 55, Great Coram-st.  
 St. Bartholomew's Hospital. Smithfield  
 St. Martin's. 42, Castle-st., Leicester-sq.  
 St. Paul's. St. Paul's Cathedral  
 Soane Museum. 13, Lincoln's-inn-fields  
 Society of Arts. 19, John-street, Adelphi  
 Southwark Lt. Inst. Portland-place,  
 Borough-road  
 Statistical Society. 12, St. James's-sq.  
 Stepney College. Stepney  
 United Service Inst. Mid. Scotland-yd.  
 University College. Gower-street  
 Veterinary Coll. College-st., Camden-tn.  
 Welsh School. Gray's-inn-road  
 Western Lit. Inst. 47, Leicester-square  
 Westminster. Westminster Abbey  
 Westminster Lit. and Sci. Inst. 6, Great  
 Smith-street  
 Woolwich Institution. Woolwich  
 Zoological Society. 57, Pall-mall

## MECHANICAL ENGINEERS.

Barlow & Co. 32, Bucklersbury  
 Bennett, J. 107, Kingsland-road  
 Bissell, Mrs. A. 106, Up. East Smithfield  
 Blyth, J. & A. 9, Fore-street, Limeho.  
 Botten, C. 23, Farringdon-street  
 Butler. 4, Oxford-street  
 Chicks & Stewart. 3, Russell-street,  
 Blackwall  
 Christy & Co. Rotherhithe-street  
 Clark & Co. 238, Wapping  
 Collinge & Co. 64, Bridge-rd., Lambeth  
 Cottam & Hallam. 2, Winsley-street;  
 76, Oxford-street  
 Deeley, G. East Buckle-st., Whitechapel  
 Fox & Co. 8, New-st., Spring-gardens  
 Frasi, G. 158, Goswell-street  
 German & Co. Bow-common  
 Grissell, H. & M. D. 1, Eagle-wharf,  
 Hoxton  
 Hall, J. & E. 23, Lombard-street  
 Hodge, S. Oak-lane, Limehouse  
 Horne, J. 14, Whitechapel High-street  
 Massie, A. Brewhouse-lane  
 Medhurst, T. 1, Denmark-street, Soho  
 Morton, R. 240, Wapping  
 Neilson, W., & Co. 15, Wharf-rd., City-rd.  
 Pontifex & Co. Shoe-lane

Pope, W., & Son. 80 and 81, Edgeware-road, Marylebone  
 Ramsden, R. 100, Kingsland-road  
 Ransome & Co. 2, Upper Charles-st., Westminster  
 Rennie, G. & Sir J. 6, Holland-street, Blackfriars  
 Rich, C. 10, Palace-row, New-road  
 Robinson, C., & Son. Pimlico-road  
 Samuda, Brothers. Orchard-pl., Blackw.  
 Shears, J., & Sons. 27, Bankside  
 Simpson & Co. Belgrave-road, Pimlico  
 Smith, W. Princes-st., Leicester-sq.  
 Telfer, A. 75, Market-st., Edgware-rd.  
 Thompson, G., & Sons. Eccleston-street East  
 Worssam, S. 11, New Manor-st., Chelsea  
 Yates, W. T. 1, John-st., Cambridge-hth.

# METAL BROKERS.

Anichini, P., sen. 5, Langbourn-chamb.  
 Cotton & Truman. 1, Royal Exchange-buildings  
 Daniels, M. 50, Threadneedle-street  
 French & Smith. 14, St. Benet's-place  
 Frisby, H. R., & Co. 21, Tokenhouse-yd.  
 Hall & Son. 6, Circus, Minories  
 James & Shakespeare. 10, Austin-friars  
 Kirkmann, Brown, & Co. 2, St. Dunstan's-hill  
 Moate, C. R. 65, Old Broad-street, City  
 Moser, J. L. Baltic Coffee-house  
 Protheroe, J., jun. 1, St. Michael's-alley  
 Richards, J. 12, George-yd., Lombard-street  
 Short, W. 1, Newman's-court, Cornhill  
 Swann, W. 14, Pinner's-hall, Old Broad-street  
 Von Dadelszen, G. M. 27, Mincing-la.  
 Whitcomb & Barton. 75, Old Broad-street, City

# METAL WAREHOUSES.

Aston, Griffiths, & Co. 11, Mark-lane  
 Bird, W. 37, Basinghall-street  
 Cohen, H. 5, Windsor-st., Bishopsgate  
 Dace, W. 136, John-street, Clerkenwell  
 Farwig, W. 26, Upper Thames-street  
 Foster, D. G. 23 & 24, St. John's-sq.  
 Glascott, T. T. 20, Brownlow-street  
 Hedgcock, J. F. 14, Little Compton-st.  
 Hoole, W. 21, St. James's-walk, Clerkenwell, and 1, Suffolk-street  
 Hughes, M. 107, Shoe-lane, Fleet-st.  
 Jackson, W. 59, Crown-street  
 Page, George. 27, Goswell-street  
 Read, J. (*gun*). 30, Brownlow-street, Long-acre  
 Stanton, Brs. (*tube*). 73, Shoe-lane  
 Twells, P. M. 2, Brownlow-street  
 Walker, E., & Son. 55, Red Lion-street, Clerkenwell  
 Young, Dawson, & Co. 98, Gracechurch-street, and Emmett-street, Poplar

# MINERALOGISTS.

Heuland, H. 31, Red Lion-square  
 Rogers, H. 9, Bell-yd., and 64, Carey-st.  
 Tennant, J. 149, Strand

# MINING COMPANIES.

Alten Mining Association (Edward J. Cole, secretary). 2, Old Broad-street  
 Alfred Consols Mining Company (R. Thomas, secretary). 8, George-yard, Lombard-street  
 Anglo-Mexican Mining Association. 5, Broad-street-buildings  
 Anglo-Mexican Mining Company (G. B. Lonsdale, sec.). 5, Broad-street, bldgs.  
 Antimony and Silver Lead Mining and Smelting Company (T. Bartlett, manager). 58, Lombard-street  
 Asturian Mining Company (K. Mackenzie, secretary). 9, Austin-friars  
 Australian Mining Company. 2, Adelaide-place, London-bridge  
 Camborne Consols Mining Company (H. L. I. Von Uster, sec.). Bridge-st., Blackfriars  
 Carn Brea Mines Office (G. Meagle, clerk). 7, Queen-street-place, Upper Thames-street  
 Carwinning Hill Mining Office (J. A. Tulins, secretary). Lombard-street-chambers, 33, Clement's-lane  
 Copiapo Mining Company (F. Grellet, secretary). 22, Austin-friars  
 Copper Mining Company (W. Tate, accountant). 5, Warnford-court, Throgmorton-street  
 Copper Mining Office (T. Curry). 3, Bond-court, Walbrook  
 Cornwall New Mining Company (G. Lockwood, sec.). 17, Essex-st., Strand  
 Cubert Silver Lead Mining Company (R. Thomas, secretary). 8, George-yard, Lombard-street  
 Cwm-Ystwith Mines Company (John Taylor, jun., manager). 6, Queen-street-place, Upper Thames-street  
 Derwent Mines Company. 9, Austinfrs.  
 Derwent Mines Company (John Taylor, jun., manager). 6, Queen-street-place, Upper Thames-street  
 Devonshire Great Consolidated Copper Mining Company (A. Allen, secretary). 16 & 17, Barge-yd.-chamb. Bucklersb.  
 Gaspé Fishery and Coal Mining Company (F. Dyken, secretary). 2, New Broad-street, City  
 General Mining Association (J. B. Ford, sec.). 52, Old Broad-st., City  
 General Mining Offices (W. H. Smith & H. W. Coates, secs.). 1, Copthall-chamb.  
 German Mining Company (T. Hackett, secretary). 26, Birchin-lane  
 Great Polgooth Mining Office (T. A. Corlett, sec.). 38, New Broad-street  
 Guadalcanal Silver Mining Association (H. Ryde, sec.). 34, Broad-st.-build.



Halkin Mining Company (J. Brand, sec.). 23, King-street, St. James's  
 Hibernian Mining Company. 6, Austin-friars  
 Holmbush Copper Mining Company (R. Thomas, secretary). 8, George-yard, Lombard-street  
 Holyford Copper Mining Company (J. W. Buckland, jun., secretary). 35, Great Winchester-street  
 Imperial Brazilian Mining Association. 52, Old Broad-street, City  
 Keswick Mining Company (W. Brown, secretary). 8, Walbrook  
 Kinzigthal Mining Association (G. C. Capper, secretary). 1, Adelaide-place, London-bridge  
 Minas Geraes Mining Company (G. D. Keogh, sec.). 8, Tokenhouse-yard  
 Mines Royal Copper Company (B. J. Spedding, secretary). Golden Hart-wharf, Dowgate, Up. Thames-street  
 National Brazilian Mining Association (Mocattbas & Cocães). 26, Throgmorton-street  
 Penycfeu and Lletenhen Silver Lead Mining Company (H. L. T. Von Uster, manager). Bridge-street, Blackfriars  
 Real del Monte Mining Company (J. Phillips, sec.). 6, Queen-st.-pl., City  
 Royal Mines of Cobre Association (W. Leckie, secretary). 26, Austin-friars  
 Royal Santiago Mining Company. 38, Broad-street-buildings  
 St. John del Rey Mining Company (Wm. Routh, sec.). 8, Tokenhouse-yd.  
 Treleigh Consolidated Copper Mines. 57, Old Broad-street, City  
 United Mexican Mining Office (J. Mather, sec.). 5, Finsbury-crescent  
 Venton Gimps Mining Company (J. J. Iselin, hon. sec.). 4, Austin-friars  
 Wellington Mining Company (R. Thomas, sec.). 8, George-yd., Lombard-st.  
 West Wheal Jewel Mining Association. 57, Old Broad-street, City  
 Wheal Jane Mining Company (R. Thomas, sec.). 8, George-yd., Lombard-st.  
 Wheal Lawrence Copper & Lead Mining Company. 2, Winchester-buildings  
 Wheal Sarah Mining Company (R. Thomas, sec.). 8, George-yd., Lombard-st.  
 Wheal Tremayne Mining Company (R. Thomas, secretary). 8, George-yard, Lombard-street

#### MUSEUMS.

Antiquarian Society. Somerset-house  
 Armourers' Hall. 81, Coleman-street  
 Artillery Company. City-road  
 Bank of England. Threadneedle-street  
 Botanical Society. 20, Bedford-street, Covent-garden  
 British Museum. Great Russell-street  
 City Museum. Guildhall

East-India Museum. East-India-house, Leadenhall-street  
 Economic Geology. Craig's-court  
 Entomological Society. 17, Old Bond-st.  
 Geological Society. Somerset-house  
 Guy's Hospital. St. Thomas's-street, Borough  
 Institution of Civil Engineers. 25, Great George-street, Westminster  
 King's College. Somerset-house  
 Linnæan Society. 32, Soho-square  
 London Hospital. Whitechapel-road  
 London Institution. Finsbury-circus  
 London Mechanics' Institution. 29, Southampton-buildings  
 Missionary Museum. 8, Bloomfield-st., Finsbury  
 Ordnance Office. 86, Pall-mall  
 Royal Asiatic Society. 14, Grafton-st.  
 Royal Botanical Society of London. Inner-circle, Regent's-park  
 Royal College of Surgeons. 40, Lincoln's-inn-fields  
 Royal Institute of British Architects. 16, Grosvenor-street  
 Royal Institution. 21, Albemarle-street  
 Royal Society. Somerset-house  
 St. Bartholomew's Hospital. West Smithfield  
 St. George's Hospital. Hyde-park-crn.  
 Sappers' Museum. Woolwich  
 Saull's Museum. 15, Aldersgate-street  
 Soane Museum (Geo. Bailey, curator). 13, Lincoln's-inn-fields  
 Society of Art. 19, John-st., Adelphi  
 Somerset-house. Navy Department  
 Tower of London  
 Trinity-house. Tower-hill  
 University College. Gower-street  
 United Service. Whitehall-yard  
 Veterinary College. College-street, Camden-town  
 Woolwich Repository. Woolwich  
 Zoological Society's Museum. Regent's-park

#### TIN MERCHANTS.

Bolitho, T. & W. 28, Fenchurch-street  
 Budd, J. & E. L. Paul's-wharf, 25, Up. Thames-street  
 Daubuz, L. C. & W. 9, New Broad-st., City  
 Enthoven, J. H. 8, Moorgate-street  
 Union Tin Smelting Company. 200, Bishopsgate-street  
 Williams, Harvey, & Co. 68, Upper Thames-street

#### MISCELLANEOUS COMPANIES.

Australian Agricultural Company (G. Engstrom, secretary). 12, King's Arms-yard  
 Australian Trust Company. 48, Moorgate-street



British Agricultural Company (J. Robinson). Northumberland-al., Fenchurch-street  
 British American Land Company (T. R. Exham). 35½, New Broad-street, City  
 British West-India Company (J. Innes). 61, Moorgate-street  
 Canada Company (J. Perry). 13, St. Helen's-place  
 Coal Factors' Committee (G. B. Robinson). Coal Exchange  
 Compressed Air Engine Company. 88, St. James's-street  
 Deal Pier Company (H. Jackson). 15, St. Helen's-place  
 Desiccating Company Patent (A. Jennings). 28, New Broad-street  
 Dhobah Company (R. Gardner). 46, Lime-street  
 Eastland Company (Thomas Cope). 25, Birchin-lane  
 Electric Printing Telegraph Office (J. Brett). 29, Parliament-street  
 Electric Telegraph Company (W. H. Hatcher). 64, Moorgate-street  
 Equivalent Company (T. G. Smith). 7, Dowgate-hill  
 Fire Protective & General Building Improvement Company (W. F. Bray). 9, Lincoln's-inn-fields  
 General Wood-cutting Company (J. M. Douglas). Belvedere-road, Lambeth  
 Gutta Percha Company (E. Granville). 11, East-India-chambers  
 Hudson's Bay Company (A. Barclay). 4, Fenchurch-street  
 Hungerford Market Company (A. L. Leith). 9, Villiers-street, Strand  
 Irish Land Investment Company (R. Taylor & Co.). 29, Birchin-lane  
 Irish Waste Land Improvement Society (F. Fry). 5, St. Mildred's-court  
 London Sewage Company (A. Martin). 4, New London-street  
 Lough Corrib Commission (J. Barwise). 18, Austin-friars  
 Lough Neagh Commission (J. Barwise). 18, Austin-friars  
 Metrop. Buildings Office. 6, Adelphi-tr.  
 Mexican Company (J. M. Maude). 32, Great Winchester-street  
 Mexican & South American Company (H. W. Schneider). 10, New Broad-street-mews  
 New Brunswick & Nova Scotia Land Company, 5, Cophall-court  
 New England Company (J. Fuller). 9, Great St. Helen's

New London Corn Exchange Company (W. W. Wren). Mark-lane  
 New Zealand Company (T. C. Harrington). 9, Broad-street-buildings  
 Norwich Union Reversionary Interest Company (H. Norris). 23, Lincoln's-inn-fields  
 Old Corn Market Company (T. Levick). Mark-lane  
 Patent Oropholithe Company (P. F. Page & Son). 14, King's-rd., Bedford-row  
 Prosser's Patent Railway Guide Wheel Company (G. Hadley). 36, New Broad-street  
 River Dee Company (B. Lyon). 9, Mansion-house-street  
 River Fergus Drainage & Embankment (J. Barwise). 18, Austin-friars  
 Road and Street Cleansing Company (J. Whitworth & Co.). Millbank-street, Westminster  
 Russia Company (T. Cope). 25, Birchin-lane  
 Shetland Fishery Company (A. Anderson). 15, St Mary-axe  
 South Australian Company (D. M' Laren). 4, New Broad-street, City  
 South Sea Company (C. F. Gibson). South Sea-house, Threadneedle-st.  
 Thames Tunnel Company (J. B. Blundell). 5, Tunnel-road; and Works, 332, Rotherhithe-street  
 Tidal Wheel Company, Patent (F. Bennett). 1, Walbrook-bldgs., Walbrook  
 Tirhoot Company (W. C. Laurie). 6, Gt. Winchester-street, City  
 Union Wine Company (G. Bishop). 32, Great St. Helen's  
 Universal Salvage Company. 12, Old Jewry-ch.  
 Van Diemen's Land Company (G. H. Howell). 6, Gt. Winchester-st., City  
 Western Australian Land Company (B. Roller). 33, Old Broad-street, City

# MINE BROKERS.

Bawden, J. Bank-chambers  
 Crofts, J. 4, King-street  
 Herron, J. 33, Clement's-la., Lomb.-st.  
 Lane, J. 80, Old Broad-street  
 Rye, H. B. 77, Old Broad-street  
 Stride, J. 27, Spring-gardens  
 Thomas, R. 8, George-yd., Lombard-st.  
 Thomas, T. P. 3, George-yd., Lombard-st.  
 Tredinneck, R. 3, King's-ct., Lombard-st.  
 Trenery, W. jun. St. Michael's-al. Cornhl.  
 Tripp, R. 3, St. Michael's-al., Cornh.  
 Watson & Cuell. 1, St. Michael's-al. Cornhl.

## BRITISH MINING COMPANIES.

Name.	Sec. or Purser.	Office.
Abergwessin Mining Company .. ..	P. P. Couch ..	Nantybrian-house, [bard-st.
Alfred Consols Mining Company ..	H. Thomas ..	8, George-yd., Lom-
Antimony and Silver Lead Mining Co.	T. Bartlett ..	58, Lombard-street.
Ashburton and United Mining Company	W. Murray ..	2, R. Exchange-bds.
Balleswidden Mining Company ..	R. N. Davis ..	Mine.
Balnoon Consols Mining Company ..	J. Roscolla ..	Mine.
Barristown Mining Company ..	T. Hacket ..	26, Birchin-lane.
Bedfont United Mines .. ..	G. Kieckhoefer ..	50, Threadneedle-st.
Birch Tor Tin Mine .. ..	—	Plymouth.
Blaenavon Iron Company .. ..	J. Booth ..	4, Pancras-lane.
Bodmin Consols .. ..	W. Murray ..	2, R. Exchange-bds.
Botallack Mine Company .. ..	J. H. James ..	Penzance.
Brewer Mine .. ..	G. Simmons ..	Truro.
British Iron Company .. ..	J. Smith ..	South Sea-house.
Budnick Consols Mine .. ..	E. Mitchell ..	Truro.
Callington Mining Company .. ..	P. Stainsby ..	200, Bishopsgate-st.
Camborne Consols Mining Company ..	H. L. T. von Uster	Bridge-street.
Cameron Steam Coal Company ..	A. C. Howden ..	2, Moorgate-street.
Caradon Copper Mine Company ..	P. Clymo, jun. ..	Liskeard.
Caradon Mine Company .. ..	S. Seccombe ..	Liskeard.
Caradon United Mining Company ..	W. D. Boase ..	Liskeard.
Caradon Wheal Hooper .. ..	—	[Up. Thames-st.
Carn Brea Mining Company .. ..	G. Meagle, Clerk ..	7, Queen-st.-place,
Carthew Consols Mining Company ..	W. Shearman ..	Manchester.
Charlestown Mining Company ..	Jno. Taylor ..	6, Queen-st.-place.
Comb Lawn Mining Company .. ..	J. Crofts ..	4, King-st., Cheapst.
Comfort Mining Company .. ..	S. & R. Davey ..	Redruth.
Condurrow Mining Company ..	N. Vivian ..	Camborne.
Cook's Kitchen Mining Company ..	R. H. Pike ..	Redruth.
Combe Valley Quarry .. ..	C. S. Richardson ..	5, Whitefriars-st.
Cornish Mining Company .. ..	Geo. Owens ..	Monument-chmbrs.
Cornwall New Mining Company ..	G. Lockwood ..	17, Essex-st., Strand.
Copper Bottom Mining Company ..	—	Camborne.
Cradock Moor Mining Company ..	E. A. Crouch ..	Liskeard.
Cwm Erfin Mining Company .. ..	T. P. Thomas ..	3, George-yard.
Cwm Ystwith Mining Company ..	J. Taylor, jun., Man.	6, Queen-st.-place.
Dean Prior and Buckfastleigh Min. Com.	C. Bourdillon ..	25, Fleet-street.
Derwent Mining Company .. ..	B. O'Connor ..	6, Queen-st.-place.
Devon and Courtenay Consols Min. Com.	W. Rendle ..	Plymouth.
Devonshire Great Consols Mining Com.	A. Allen ..	Barge-yd. Bucklrsb.
Dolcoath Mining Company .. ..	Com. Adventurers ..	Camborne.
Drake Walls Mining Company ..	P. Stainsby ..	200, Bishopsgate-st.
Durham County Coal Company ..	W. Brogden ..	Stockton.
Dyfnwgwm Mining Company .. ..	G. Hadley ..	8, Old Jewry.
East Birch Tor Mining Company ..	A. Redwin ..	8, Old Jewry.
East Caradon Mining Company ..	Capt. Clymo ..	Liskeard.
East Crowndale Mining Company ..	E. J. Cole ..	2, New Broad-st.
East Pool Mining Company .. ..	Com. of Managemnt.	Camborne.
East Tamar Consols Mining Company	G. Kieckhoefer ..	50, Threadneedle-st.
East Wheal Crofty Mining Company ..	Adventurers ..	Mine, Camborne.
East Wheal George .. ..	H. English ..	25, Fleet-street.
East Wheal Rose Mining Company ..	E. Mitchell ..	Truro.
East Wheal Seton .. ..	Capt. Evans ..	Mine.
Esgair Lle Mining Company .. ..	T. P. Thomas ..	3, George-yard.
Exmoor Wheal Eliza Mining Company	J. H. Hitchens ..	Exeter.
Fowey Consols Mining Company ..	W. Davis, Capt. R. M.	Fowey.
General Mining Company for Ireland ..	T. Macguire ..	2, Burgh-quay, Dub.

Name.	Sec. or Purser.	Office.
Gonamena Mining Company .. ..	E. A. Crouch ..	Liskeard.
Great Consols Mining Company ..	Com. of Managemnt.	Gwennap.
Great Polgooth .. ..	T. A. Corbett ..	38, New Broad-st.
Great Wheal Rough Tor Consols Mg. C.	W. A. Thomas ..	50, Threadneedle-st.
Growa Slate Company .. ..	W. W. Mansell ..	57, Threadneedle-st.
Gwinear Consols Mining Company ..	R. R. Mitchell ..	3, King's-court.
Halkin Mining Company .. ..	J. Brand ..	23, King-st. St. James
Heingsston Down Consolidated Min. Co.	G. Kieckhoefer ..	50, Threadneedle-st.
Herodsfoot Mining Company .. ..	J. Wolfarton ..	Beeralston.
Hibernian Mining Company .. ..	W. H. Porter ..	6, Austin-friars.
Holmbush Mining Company .. ..	R. Thomas ..	8, George-yard.
Holyford Copper Mines .. ..	J. W. Buckland ..	34, Gt Winchester-st.
Keswick Mining Company .. ..	John Watson ..	3, George-yard.
Kingsett and Bedford Mining Company	J. Tirnewell ..	Exeter.
Kirkcudbrightshire Mining Company ..	T. Hacket ..	26, Birchin-lane.
Lamerhooe Wheal Maria Mining Com.	J. Crofts ..	4, King-street.
Lanarth Consols Mining Company ..	W. Richards ..	Penzance.
Lelant Consols Mining Company ..		
Levant Mining Company .. ..	W. Dunbury ..	Truro.
Lewes Mining Company .. ..	P. Stainsby ..	200, Bishopsgate-st.
Llwyn Malies Mining Company ..	J. Maitland ..	12, Copthall-court.
Llynvi Iron Company .. ..	F. W. Gibbon ..	15, Old Jewry-chmb.
Lostwithiel Consols Mining Company ..	J. Crofts ..	4, King-street.
Marke Valley Mining Company ..	Capt. Seecombe ..	Linkinhorne.
Mendip Hills Mining Company ..	P. Stainsby ..	200, Bishopsgate-st.
Metha Mining Company .. ..	Bullock & Luscombe	Lincoln's-inn.
Mining Company of Ireland .. ..	R. Pursly ..	Low.-Orm.-qy. Dub.
Mordirtonham Consols .. ..	J. Nicholson ..	90, New Bond-st.
New East Crowndale Mining Company		
North Pool Mining Company .. ..	H. Borrow ..	Truro.
North Roskear Mining Company ..	— Hutchinson ..	Camborne.
North Wheal Leisure Mining Company		
North Wheal Basset .. ..	R. Lyle ..	34, Gt Winchester-st.
Par Consols Mining Company .. ..	W. Davis, Capt. R. M.	Fowey.
Pennant and Craigwen Mining Company	W. W. Mansell ..	57, Threadneedle-st.
Penrhw Mining Company .. ..		
Peny-Cefn Lletenhen Mines .. ..	H. L. T. Von Uster	Bridge-street.
Penzance Consols Mining Company ..	J. Carthew ..	St. Just.
Plymouth Wheal Yeoland Mining Com.	—	Jump.
Polsaith Consols Mining Company ..	R. Taylor ..	St. Cleer.
Rhoswiddol and Bachelton Mining Co.	G. Hadley ..	3, Old Jewry.
Rhymney Iron Company .. ..	T. E. Scudamore ..	Lawrence Pountney- [hill]
Rosewell Hill Mining Company ..		
Ruunaford Combe Tin Mining Compny.	R. Manuel ..	Woolwich.
South Tamar Consols Mining Company	G. Kieckhoefer ..	50, Threadneedle-st.
South Caradon Mining Company ..	T. Kittow ..	Liskeard.
South Dolcoath Mining Company ..	P. Stainsby ..	200, Bishopsgate-st.
South Friendship Wheal Ann Min. Com.	— Cudlipp ..	Tavistock.
South Molton Mining Company ..	J. Clymo ..	Liskeard.
South Plain Wood .. ..	J. Nicholson ..	90, New Bond-st.
South Tolgus Mining Company ..	J. Taylor ..	6, Queen-st. place.
South Trelawney Mining Company ..	T. Hackett ..	26, Birchin-lane.
South Wales Mining Company ..	T. P. Thomas ..	3, George-yard.
South Wheal Bassett Mining Company	W. Richards ..	Redruth.
South Wheal Josiah Mining Company	J. Hambly ..	Calstock.
South Wheal Maria Mining Company ..	—	Tavistock.
Southern and Western Irish Min. Com.	W. Connell ..	South Mall, Cork.
Spearne Moor Mining Company ..	—	Balleswidden.
St. Anstell Consols Mining Company ..	— Hodge ..	St. Anstell.
St. Michael Penkwe .. ..	— Lowry ..	Truro.
St. Minver Consols Mining Company ..	—	Padstow.
Stray Park Mining Company .. ..	W. Vawdrey ..	Penwll Hoyle.

Name.	Sec. or Purser.	Office.
Tamar Consols Mining Company ..	P. Stainsby.. ..	200, Bishopsgate-st.
Tavy Consols Mining Company ..	P. Fisher .. ..	Plymouth.
Tincroft Mining Company .. ..	P. Stainsby.. ..	200, Bishopsgate-st.
Tin Vale Mining Company .. ..	W. W. Mansell ..	57, Threadneedle-st.
Tollorgoch .. .. ..	— Jones .. ..	Rill, Flintshire.
Tregordan Mining Company .. ..	J. Philp .. ..	Liskeard.
Trehane Mining Company .. ..	J. Philp .. ..	Liskeard.
Treleigh Consols Mining Company ..	W. Nicholson ..	57, Old Broad-st.
Trenance Mining Company .. ..	T. Watson .. ..	12, Cornhill.
Tresavean Mining Company .. ..	Thos. Curry .. ..	Bond-ct., Walbrook
Trethellan Mining Company .. ..	Thos. Curry .. ..	Bond-ct., Walbrook
Treviskey and Barrier Mining Company	J. Williams, Jr. & Brs.	Scorrier, Truro.
United Mines Company .. ..	J. Taylor .. ..	2, Abchurch-lane.
Wellington Mines Company .. ..	R. Thomas .. ..	8, George-yard.
West Buller Mining Company .. ..	J. & R. Davey ..	Redruth.
West Caradon Mining Company ..	E. A. Crouch ..	Liskeard.
West Fowey Consols Mining Company	W. Davis .. ..	Fowey.
West Providence Mining Company ..	R. R. Michell ..	Marazion.
West Seton Mining Company .. ..	R. Harvey .. ..	St. Day.
West Trethellan Mining Company ..	W. Richards ..	Redruth.
West United Hills Mining Company ..	H. Ellery .. ..	Truro.
West Wheal Francis Mining Company	J. Reynolds ..	Camborne.
West Wheal Jewel Mining Company ..	W. Nicholson ..	57, Old Broad-st.
West Wheal Tolgus Mining Company..	W. Richards ..	Redruth.
West Wheal Treasury Mining Company	W. Burgess ..	Camborne.
Wheal Adams Mining Company ..	T. Hackett .. ..	26, Birchinn-lane.
Wheal Agar Mining Company .. ..	J. MacDonnell ..	Broad-st.-buildings
Wheal Anderton Mining Company ..	J. Carpenter ..	Tavistock.
Wheal Anna Maria Mining Company ..	— .. ..	Dunsford, nr. Exeter
Wheal Ash Mining Company .. ..	— .. ..	Tavistock.
Wheal Bal Mining Company .. ..	J. Carthaw .. ..	St. Just. [Manch.
Wheal Barbara .. .. ..	W. Shearman ..	Stamp Office-buildgs.
Wheal Benny Mining Company .. ..	J. Crofts .. ..	4, King-street.
Wheal Blencowe Mining Company ..	J. Dale .. ..	Mine.
Wheal Calstock Mining Company ..	— .. ..	Calstock.
Wheal Coad Mining Company .. ..	— .. ..	Lombard-street.
Wheal Comfort .. .. ..	J. R. Davey .. ..	Redruth.
Wheal Courtenay Mining Company ..	E. Lyne .. ..	St. Columb.
Wheal Crebor .. .. ..	J. H. Murchison ..	76, Cornhill.
Wheal Fortescue Mining Company ..	J. Matthews ..	Tavistock.
Wheal Franco Mining Company ..	— .. ..	Tavistock.
Wheal Henry Mining Company .. ..	J. Tippet .. ..	Truro.
Wheal Jane .. .. ..	R. Thomas .. ..	8, George-yard.
Wheal Lawrence Mining Company ..	T. A. Readwin ..	2, Winchester-bldgs.
Wheal May .. .. ..	C. S. Richardson ..	15, Old Broad-st.
Wheal Mary Ann Mining Company ..	P. Clymo, jun. ..	Liskeard.
Wheal Mary Consols Mining Company	E. A. Crouch ..	Liskeard.
Wheal Penhale Mining Company ..	W. Shearman ..	Manchester.
Wheal Reeth Consolidated Mines Comp.	— .. ..	Albion-st., Leeds.
Wheal Russell .. .. ..	J. H. Hitchens ..	Tavistock.
Wheal Sarah .. .. ..	R. Thomas .. ..	8, George-yard.
Wheal Seton Mining Company .. ..	T. & H. Tilly ..	Falmouth.
Wheal Sisters Mining Company .. ..	E. A. Crouch ..	Liskeard.
Wheal Sophia Mining Company ..	J. Bennett .. ..	Mine.
Wheal Trehane .. .. ..	J. Philp .. ..	Liskeard.
Wheal Trescoll Mining Company ..	C. S. Richardson ..	15, Old Broad-st.
Wheal Trelawney Mining Company ..	J. Bryant .. ..	Liskeard.
Wheal Tremayne Mining Company ..	R. Thomas .. ..	8, George-yard.
Wheal Williams Mining Company ..	N. Bassett .. ..	Truro.
Wicklow Copper Mines Company ..	J. Barnes .. ..	Vale of Ovoca.



## FOREIGN MINES.

Name.	Place.	Secretary.	Office.
Alten Mining Company ..	Norway	E. J. Cole ..	2, New Broad-st.
Asturian Mining Company ..	Spain ..	K. Mackenzie ..	9, Austin-friars.
Australian Mining Company	Australia	— Josephs ..	2, Adelaide-place.
Anglo-Mexican Mining Assoc.	Mexico	J. Godfrey ..	5, Broad-st.-bldgs.
Anglo-Mexican Mint Compy.	Mexico	G. B. Lonsdale ..	5, Broad-st.-bldgs.
Barossa Range Mining Comp.	Australia	Coode, Brown, & Co.	13, Bedford-row.
Brazilian Imperial .. ..	Brazils..	G. Thomas, Man. Dir.	52, Old Broad-street.
Cobre Copper Mine Company	Cuba ..	W. Leckie ..	26, Austin-friars.
Copiapo Mining Company ..	Cuba ..	F. Grelliett ..	22, Austin-friars.
General Mining Association..	No. Scot.	T. B. Frood ..	52, Old Broad-street.
Guadalcanal Mining Company	Spain ..	H. T. Ryde ..	34, Broad-st.-bldgs.
Kinzigthal Mining Association	Australia	G. C. Capper ..	1, Adelaide-place.
Linares Mining Company ..	Spain ..	J. Eaton ..	2, Old Broad-street.
Mexican Company .. ..	Mexico..	J. M. Maude ..	Gt. Winchester-st.
Mexican & S. American Com.	Mexico	H. W. Schneider ..	10, Nw Broad-st. mws
National Brazilian Mg. Assoc.	Brazils..	J. Kempson, jun. ..	2, New Broad-street.
North British Australasian ..	Australia	Jopp & Shaw ..	Aberdeen.
Real Del Monte Mining Com.	Mexico	J. Phillips ..	6, Queen-st.-place.
Royal Santiago Mining Assoc.	Cuba ..	— Docker ..	Broad-st.-buildngs.
Scottish Australian .. ..	Australia	Stronach & Grainger	Aberdeen.
St. John del Rey Min. Assoc.	Brazils..	W. Routh ..	8, Tokenhouse-yard
United Mexican Ming. Assoc.	Mexico	J. Mather ..	5, Finsbury crescent
Worthing Mining Company..	S. Austrl.	J. H. Murchison ..	70, Cornhill.

## GENERAL POSTAL REGULATIONS, &amp;c.

**RATES OF POSTAGE.**—All letters from one part of Great Britain to another (including the Local Penny Posts and the London Twopenny Post) are charged, if pre-paid, and not

Exceeding half an ounce .. .. . 1d.

Exceeding half an ounce, and not exceeding one ounce .. 2d.

and so on at the rate of 2d. for every additional ounce or fraction of an ounce. Unpaid and unstamped letters are charged double postage on delivery.

**HOURS OF POSTING FOR THE EVENING MAILS.**—The Receiving-houses close at 5 30 P.M.; but letters are received for the evening's despatch until 6 P.M., if an extra penny stamp is affixed. The Branch Post-offices at Charing-cross, Old Cavendish-street, and Stone's-end, Southwark, receive letters until 6 P.M., and until a quarter to 7 P.M., and till 7 by affixing an additional penny stamp. At the Branch Post-office in Lombard-street, the box remains open without additional fee until 6 P.M., and until 7 P.M. by affixing a penny stamp. At the General Post-office, in St. Martin's-le-Grand, until 6, free; and until 7, by payment of the extra charge as at Lombard-street. From 7 to half-past 7 P.M., letters may be posted at the General Post-office upon payment of a fee of 6d. each, which must, as well as the postage, be pre-paid. Letters intended to pass by outward mails to foreign parts must be posted at the above hours.—N.B. Newspapers for the evening mails must be put into the Receiving-houses before 5 P.M., the Branch-offices before 5 30, or General Post-office before 6 P.M. From 6 P.M. to 7 30, on payment of one halfpenny late fee; except newspapers for foreign parts, which must be posted at the General Post-office and Branch-offices before 6 P.M., and at the Receiving-houses before 5 P.M.

**MORNING MAILS** are forwarded to most of the principal towns in England and Wales, and to all parts of Ireland and Scotland, for which the letter-boxes at the Receiving-houses will be open till 7 A.M. for newspapers, and a quarter to 8 A.M. for letters; and at the Branch-offices—Charing-cross, Old Cavendish-street, and the Borough—for newspapers until 7 A.M., and for letters until 8 A.M. At the General Post-office and the Branch-office, in Lombard-street, the boxes will close for newspapers at a quarter before 8 A.M., and for letters at half-past 8 A.M.

Any **SINGLE BOOK** or **PAMPHLET** can now be sent through the Post-office to any part of the United Kingdom, if not exceeding 16 oz. in weight, and open at both ends, by affixing six postage stamps; if above 16 oz. 1s., and 6d. for every additional pound or fraction of a pound. The Postmaster-General does not guarantee the delivery of books and pamphlets with the same accuracy and regularity as newspapers and letters, but in no case will the delivery be delayed more than twenty-four hours after the usual post.

**BRITISH AND COLONIAL PAPERS** between British colonies, without passing through the United Kingdom, to be free; except that 1d. may be allowed as a gratuity to the master of the vessel conveying them.

**NEWSPAPERS, BRITISH, FOREIGN, OR COLONIAL**, passing between British or Colonial and Foreign ports, and through the British post, to pay 2d.; if not through the British post, 1d.

**NEW POSTAGE STAMPS** intended principally for the pre-payment of foreign letters have been issued. They are of the value of 1s. each, the colour being green, and the form octagonal, and another of the value of 10d. of a brown colour. These stamps may be used for inland as well as foreign postage, but they are chiefly intended for the postage of letters to the United States, India, China, the West Indies, New South Wales, and New Zealand, &c.

**PACKAGES**, which in length, breadth, or width, exceed 24 inches, cannot be forwarded by post between any places within the United Kingdom, except, however, petitions or addresses to her Majesty, or petitions to either House of Parliament forwarded to any member of either house, or printed votes or proceedings of Parliament, or letters to or from any Government offices or departments.

**MONEY ORDERS.**—With a view to simplicity and economy in the accounts of the Money-order-office, it has been found necessary to lay down the following rules:—1. Every money-order issued on or after the 6th October, 1848, must be presented for payment before the end of the second calendar month after that in which it was issued (for instance, if issued in October, it must be presented for payment before the end of December), otherwise a new order will be necessary, for which a second commission must be paid. 2. As already notified to the public, if an order be not presented for payment before the end of the twelfth calendar month after that in which it was issued (for instance, if issued in October and not presented before the end of the next October), the money will not be paid at all. 3. As, after once paying a money-order, by whomsoever presented, the office will not be liable to any further claim, the public are strictly cautioned—*a.* To take all means to prevent the loss of the money-order. *b.* Never to send a money-order in the same letter with the information required on payment thereof. *c.* To be careful, on taking out a money-order, to state correctly the Christian name as well as the surname of the person in whose favour it is to be drawn. *d.* To see that the name, address, and occupation of the person taking out the money-order are correctly known to the person in whose favour it is drawn. 4. Neglect of these instructions will lead to delay and trouble in obtaining payment, and even risk the loss of the money. These instructions, together with some others of minor importance, will be found printed on every money-order.

**LONDON DISTRICT POST-OFFICE.**—The principal office is at the General Post-Office, St. Martin's-le-Grand, where letters may be posted one hour later up to 12 o'clock, and three quarters of an hour later at each despatch up to 6 o'clock, than at the receiving-houses. There are *ten* deliveries of letters in London daily.

**NEWSPAPERS AND PRINTED PAPERS.**—Newspapers are entitled to pass free. They must be put into the receiving-houses before 5 P.M. or 7 A.M.; at the branch post-offices before half-past 5 P.M. or half-past 7 A.M.; or at the General Post-Office, St. Martin's-le-Grand, before 6 P.M., or a quarter before 8 A.M. Newspapers put into the late Newspaper Windows at St. Martin's-le-Grand, from 6 until half-past 7 P.M., with a halfpenny each, will be despatched the same evening. News-

papers for the Colonies and Foreign countries cannot be received after 6. Newspapers to the British Colonies and possessions pass free if posted within seven days after the day of publication (the Cape of Good Hope excepted, there being no regular packet to that place). To other foreign ports the postage on each newspaper is either 1*d.* or 2*d.* Newspapers pass free to France and Belgium, but are charged on delivery with a fee of 4 centimes (nearly one halfpenny). Newspapers from France and Belgium are charged with a fee of one halfpenny on delivery here.

REGISTRATION.—This consists in the payment of a fee of 6*d.*, in addition to the ordinary rate of postage, for which a printed acknowledgment is given by the postmaster, and the safe delivery of the letter is guaranteed by the Post-Office. In the case of foreign, colonial, or ship letters, this guarantee only extends to the port of despatch in the United Kingdom—letters addressed to France form an exception. The registration 6*d.* must always be paid *in money*, but the prepayment of postage may be effected in the usual way, by the letter bearing the required number of stamps. Registered letters must be posted half an hour before the ordinary time for closing the box.

PRICES CURRENT, when bearing a newspaper stamp and under 2 oz., are subject to the same rates as newspapers; unstamped price currents, such as Lloyd's List, London New Price Current, &c. &c., are charged 1*d.* to any part.

FOREIGN MAILS are made up in London for France, and all places through France, daily, except Sunday.—Hambro' and Holland, Tuesday and Friday.—Flanders, daily, except Sunday.—Spain and Portugal, 7th, 17th, and 27th of each month.—Brazil, &c., first Tuesday in the month.—Mediterranean, Greece, &c., *vid* Falmouth, Saturday nearest the 15th and last day of each month.—Egypt, China, and Australia, *vid* Southampton, 3rd and 20th of each month, and 7th and 24th of each month *vid* Marseilles.—West Indies, 1st and 15th of each month.—Mexico, &c., 1st of each month.—North America, 3rd and 18th of each month.

## FOREIGN PACKET RATES OF LETTERS.

### BY PACKETS FROM LONDON.

Between the United Kingdom and		Single rate.
		<i>s.</i> <i>d.</i>
Prussia, <i>vid</i> Hamburg and Holland, uniform British and foreign rate, not exceeding $\frac{1}{2}$ oz.....		1 0
Ditto, <i>vid</i> Belgium, uniform ditto ditto, under $\frac{1}{4}$ oz. ....		1 0
Countries on the Continent of Europe, <i>vid</i> Prussia: Mecklenburg Schwerin, Mecklenburg Strelitz, Oldenburg, and Saxony, uniform ditto ditto, under $\frac{1}{4}$ oz.....		1 3
German States (except Wurtemberg) served by the post-office of Tour and Taxis, ditto ditto .....		1 4
Poland, ditto ditto .....		2 1
Russia, ditto ditto .....		1 7
Sweden, ditto ditto.....		1 10
Austrian States (by route of Belgium and Holland) ditto ditto.....		1 8
Austrian Silesia and Galicia (ditto of Hamburg) ditto ditto .....		1 3
All other parts of the Austrian States (ditto) ditto ditto .....		1 7
Holland, uniform British and foreign rate, not exceeding $\frac{1}{2}$ oz. ....		1 0
Hanover and Brunswick, ditto .....		0 9
Denmark, ditto.....		0 10
Lubeck, ditto .....		0 9
Hamburg, ditto.....		0 8
Bremen, ditto .....		0 8
Oldenburg, ditto .....		0 9
Mecklenburg Schwerin, ditto .....		0 10
<i>a</i> Heligoland, uniform rate of .....		0 6
<i>a</i> Cuxhaven, ditto.....		0 6
<i>a</i> Countries on the Continent, <i>vid</i> Holland, ditto .....		0 8
<i>a</i> Java, <i>vid</i> Holland, ditto .....		1 0



	Single rate.
<i>a</i> Sweden, Norway, and Mecklenburg Strelitz, if addressed <i>vid</i> Hamburg, and not intended to be forwarded through Prussia—packet rate from London, 1s. 8d.; inland postage, if not posted or delivered at the port, 2d.; total single rate .....	s. d. 1 10

## BY PACKETS FROM SOUTHAMPTON.

Between the United Kingdom and

<i>a</i> Lisbon .....	1 3
<i>a</i> Spain (by Southampton packet) .....	2 2
<i>a</i> Greece and Egypt (Alexandria excepted) .....	1 6
<i>a</i> Alexandria .....	1 6
<i>a</i> Chili, Peru, and Western Coast of America .....	2 0
<i>a</i> Hayti and the Foreign West India Islands (Cuba excepted) .....	1 5
<i>a</i> New Grenada and Venezuela .....	1 0
Mexico and Cuba .....	2 3
Gibraltar .....	1 0
Malta .....	1 0
Ionian Islands .....	1 0
Honduras .....	1 0
British West Indies (Jamaica and Berbice excepted) .....	1 0
Kingston, Jamaica .....	1 0
Aden, <i>vid</i> Southampton .....	1 0
Ceylon, <i>vid</i> Southampton .....	1 0
India, <i>vid</i> Southampton .....	1 0
Hong Kong, <i>vid</i> Southampton .....	1 0
<i>a</i> Madeira, <i>vid</i> Lisbon .....	1 9
<i>a</i> Ditto, by West Indian Packet .....	1 10
Jamaica, the Packet Port of Kingston excepted, including the internal colonial rate of 2d. ....	1 2
Berbice, ditto .....	1 2

## BY PACKETS FROM DOVER.

Between the United Kingdom and

Belgium, British and Foreign, under $\frac{1}{4}$ oz. ....	1 0
<i>a</i> Countries on the Continent of Europe, <i>vid</i> Belgium, uniform British rate, not exceeding $\frac{1}{4}$ oz. ....	0 8
France and Algeria, British and foreign rate, under $\frac{1}{4}$ oz. ....	0 10
Belgium, <i>vid</i> France, ditto .....	0 10
<i>a</i> Spain, Portugal, Sardinia, Tuscany, and Lucca, <i>vid</i> France, ditto .....	0 10
<i>a</i> Prussia, Northern Russia, Belgium, Holland, Two Sicilies, Papal States, Modena, Parma, Placentia, Greece, Archipelago, and Ionian Islands, <i>vid</i> France, uniform British rate, not exceeding $\frac{1}{4}$ oz. ....	0 5
Bavaria, <i>vid</i> France, ditto .....	0 5
Austrian dominions and cities of Cracow and Belgrade, <i>vid</i> France, uniform British and foreign rate, under $\frac{1}{4}$ oz. ....	1 5
Baden, ditto .....	0 9
Wurtemberg, ditto .....	0 10
Switzerland, ditto .....	0 11
Certain Northern States of Europe, forwarded through the office of Tour and Taxis, <i>vid</i> France, ditto .....	1 8
Certain States of Germany, served by the office of Tour and Taxis, <i>vid</i> France, ditto .....	1 3
Wallachia and Moldavia, <i>vid</i> France, ditto .....	1 9
Turkey in Europe (Belgrade excepted) and Scutari in Asia, <i>vid</i> France, ditto .....	1 11
Southern Poland ( <i>viz.</i> the Governments of Cracow, Lublin, and Sandomier) and Southern Russia, <i>vid</i> France, ditto .....	1 6
Alexandria, Beyrout, Smyrna, Dardanelles, and Constantinople, by French Packets, <i>vid</i> Marseilles, ditto .....	1 3
Tuscany and Naples, ditto ditto .....	1 9
<i>a</i> Sardinia and Sicily, ditto ditto .....	1 3
Roman States, ditto .....	1 7
Greece, ditto ditto .....	1 5
Malta, ditto ditto .....	1 1



	Single rate.
	s. d.
Malta, monthly closed Mail, <i>vid</i> Marseilles, ditto .....	1 3
Alexandria, ditto ditto .....	1 8
<i>a</i> India, ditto ditto .....	1 10
<i>a</i> Hong Kong, ditto ditto .....	1 10
<i>a</i> Ionian Islands, ditto ditto .....	1 8

BY PACKETS FROM LIVERPOOL.

United States, uniform British and foreign rate, not exceeding $\frac{1}{2}$ oz. ....	1 0
Bermuda and Newfoundland, uniform rate of .....	1 0
† Nova Scotia, New Brunswick, and Prince Edward's Island, uniform rate of	1 0
† Canada, uniform British and foreign rate .....	1 2

† This includes the internal colonial rate of 2d. per  $\frac{1}{2}$  oz.

BY PACKETS FROM FALMOUTH.

	Packet rate from Falmouth.	Inland postage, if not posted or delivered at the port.	Total single rate.
	s. d.	s. d.	s. d.
<i>a</i> Madeira .....	1 8	0 2	1 10
<i>a</i> Brazil .....	2 7	0 2	2 9
<i>a</i> Buenos Ayres .....	2 5	0 2	2 7

\*\* The postage marked *a* must be paid in advance.

PUBLISHED EVERY SATURDAY, PRICE SIXPENCE,

# **THE MINING JOURNAL,**

## **RAILWAY AND COMMERCIAL GAZETTE.**

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EDITED BY HENRY ENGLISH,

*Editor of "The Mining Review," "The Mining Almanack," &c. &c.*

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*&c. &c. &c.*

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Of a Submarine Engine of Warfare, for destroying the enemy's men-of-war, while sailing or at anchor, by means of barrels of gunpowder ;

Of a System of Atmospheric Railway, the vacuum maintained by spring-pressure ;

Of the Light Saddle, meant to carry four or six dragoons, armed with rifles and a rest, instead of carrying one dragoon, armed as they are at present with pistols and carbines.

In the Arts, Major B. is a Sculptor in Onyx, an Amateur Painter, and has written several Plays.

In Music, he is the Inventor of a System of playing Chords on the Pianoforte, and Inventor of a Leaf-turner.

In Billiards, he is the Inventor of the Permanent Level.

He is likewise the Inventor of the Frame-pavement.

Major B. is the Inventor of a number of other Naval, Military, and Scientific Works, reserved for future occasions.

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TO IRONMASTERS, ENGINEERS, AND OTHERS.

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**CONDIE'S**

**IMPROVED PATENT STEAM HAMMER.**

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THE Subscriber begs most respectfully to call the attention of parties interested to his PATENT IMPROVED STEAM HAMMER, which has now been in constant OPERATION at GOVAN IRON-WORKS since February, 1848. This improved and simple machine has been successful far beyond the most sanguine expectations of the inventor, and can be kept up with less than the usual wear and tear of an ordinary high-pressure steam-engine, as has been satisfactorily proved by the working of two of these hammers at the above establishment. The Subscriber strongly recommends his hammer of  $2\frac{1}{2}$  tons, with his patent anvil for puddling, forge, and slabbing purposes, which can be wrought so economically, that it will pay its own cost in about 18 months.

The PATENT ANVILS alone last from eight to ten times longer than the common ones.

The Subscriber's professional avocations have so engrossed his attention, that he has been, in a great measure, compelled to neglect his commercial interest in bringing his patent before the public; but he is now happy to say, that he has arranged with Messrs. JOHN DIXON & CO., PAISLEY, for their MANUFACTURE; and as those gentlemen have made several of the hammers, they are fully conversant with all the mechanism of the patent.

Any weight of hammer, from 1 cwt. to 5 tons, can be made—alike suitable for the smith's shop, the ironmaster, or the jobbing forge.

For particulars apply to Messrs. JOHN DIXON & Co., Engineers, Paisley; or to

JOHN CONDIE,  
Govan Iron-Works, Glasgow.

N.B.—Parties interested are invited to call at Govan Iron-Works and see those machines, which are in operation day and night.

ADVERTISEMENTS.

# WILKINS & WEATHERLY,

MANUFACTURERS OF  
ANDREW SMITH'S PATENT IMPROVED

## WIRE ROPE,

FOR

MINES, RAILWAYS, BRIDGES, STANDING RIGGING,  
LIGHTNING CONDUCTORS,  
AND GENERAL PURPOSES.

MANUFACTORY REMOVED FROM MILLWALL TO  
39, HIGH STREET, WAPPING,  
NEAR THE LONDON DOCKS, LONDON.

PRICE of WIRE ROPE, 56s. per Cwt. If Galvanised, 66s. per Cwt.

Wire Rope.			Hempen Rope.			Chain.			Breaking Strain.	Working Load.	
Size.	Weight per Yard.		Size.	Weight per Yard.		Size.	Weight per Yard.				
In.	lb.	oz.	In.	lb.	oz.	In.	lb.	oz.	Tons. Cwt.	Cwt.	
1½	1	0	3	1	10	1½	2	8	2	5	8
1¾	1	3	4	2	4	2½	4	8	4	6	13
2	1	11	5	3	1	3	8	0	6	7	18
2½	2	12	6	4	8	3½	11	0	8	11	30
3	3	11	7	6	0	4	15	0	11	14	45
3½	5	2	8	7	0	4½	20	8	15	6	60
4	6	12	9	9	8	5	27	0	19	6	73
4½	8	12	10	12	8	5½	34	0	24	8	84
5	11	0	11	15	8	6	42	0	32	5	99

PRICE of FLAT WIRE ROPE, 63s. per Cwt. If Galvanized, 80s. do.

Hemp.		Wire.			
Size.	lbs. Weight per Yard.	Size.	lbs. Weight per Yard.	Breaking Strain.	Working Load.
Inches.		Inches.	lb. oz.	Tons.	Cwt.
4 .. 1	8	2 .. ½	4 8	15	35
4½ .. 1½	10	2½ .. ¾	5 4	17	40
5 .. 1¾	12½	2¾ .. 1	6 0	21	48
5½ .. 1½	13½	3 .. 1½	7 8	24	58
6 .. 1¾	14	3½ .. 1¾	8 12	30	68
7 .. 1¾	17	4 .. 2	10 12	36	78
8½ .. 2½	20½	4½ .. 2½	12 0	41	90

Lightning Conductors..... { 1½, 1¾, 1½, inches circumference,  
8d. 10d. 1s. per foot.

Iron Sash Line..... { ¾, 1, 1½, 2, 1 inch, } per yard.  
2d. 3d. 4d. 5d. 6d.

Copper ditto ..... 4d. 5d. 7d. 10d. 15d. ditto.

Strand for Fencing, Signal Cord for Railways, Pits, &c., 56s. ungalvanized, and  
66s. and 70s. galvanized (according to size), per cwt.

TERMS:—Bill at Four Months, or 2½ per cent. Discount for Cash.



**WILLIAM SMITH AND COMPANY,**  
(LATE SMITH & ENGLISH),  
**ENGINEERS, MILLWRIGHTS, MACHINISTS,**  
**FOUNDERS, &c.**

69, PRINCES STREET, LEICESTER SQUARE,  
LONDON,

Manufacturers of STEAM-ENGINES, BOILERS, and MACHINERY  
of various constructions for Mining and Railway Works.

SELF-ACTING INCLINES, on an *improved* plan, fitted up complete  
(including Patent Wire Rope, &c.).

Improved CANAL LIFTS, with CAISSONS, LOCK GATES, SELF-ACTING  
SLUICES, COMPENSATING MILL-HEADS, the Patent Wrought-Iron  
OVERSHOT WATER-WHEELS, with Improved SHROUD and BUCKETS;  
also the same in parts, weighing under 240 lbs. each, for easy transport  
to Brazil, Mexico, &c.

Patent Steam PILE-DRIVING ENGINES.

Steam DREDGING BOATS.

Patent Steam EXCAVATING ENGINES and TUNNELLING Machinery,  
with continuous Trams.

Very powerful BALLASTING ENGINES, TRAMS, and WAGGONS.

Patent POINTS and SWITCHES; Patent TURNABLES; Patent Aux-  
iliary DISTANCE and DAY and NIGHT SIGNALS; Improved LEVEL-  
CROSSING GATES, also with self-acting closing gear.

WASTE-POWER PUMPS, with Tanks and Water-Cranes for Railway  
Stations.

RAILWAY SHEDS, and GALVANIZED IRON ROOFS and STORES.

Bow and String, compound Tension, ARCH and FLAT GIRDER  
BRIDGES.

Improved Steam MACHINERY for UNLOADING COLLIERS and other  
Vessels.

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**Patentees and Manufacturers**

of various Improvements connected with Buildings and works of  
construction.

GAS WORKS (Buildings and Apparatus erected complete), RETORT,  
PIPE, and other castings.

**Machinery Designed—Plans and Estimates.**

VALUATIONS and SURVEYS; EXPERIMENTS, ANALYSES,  
and REPORTS.

# WARRANTED SAFETY FUSE.

W. BRUNTON & CO.

Beg to inform Mine Agents, Contractors, and Merchants, that having completed their Machinery for the MANUFACTURE of the above ARTICLE, they are enabled to offer FUSE of a very superior quality, and at considerably reduced prices.

W. B. & CO. can supply FUSE in ANY LENGTHS that may be required.

PENHELICK FUSE FACTORY,  
*Pool, Truro, Cornwall.*

## TESTIMONIALS.

*North Pool Mine, Nov. 27, 1849.*

GENTLEMEN,—We have had your Safety Fuse in constant use during the last seven months, and have much pleasure in expressing our own satisfaction with it, and in being able to tell you that we have not had a single complaint of your Fuse made by any of our men during the whole period—though they are particularly instructed to return any bad materials which may be supplied to them.

Messrs. W. Brunton & Co. JAMES EVANS, Manager, FREDERICK EVANS.  
JOHN NANCARROW, HENRY JAMES.

*Tincroft Mine, Nov. 27, 1849.*

GENTLEMEN,—Since last March, when you commenced manufacturing Safety Fuse, we have had Fuse of your make in daily use in all parts of our mine, and can with strict impartiality state, that the article supplied by you has been excellent. In proof of this we may mention, that during the whole of that time we have not had a single accident of any description.

Messrs. W. Brunton & Co. PETER FLOYD, Manager, JOHN THOMAS,  
THOMAS STAINSEY, HENRY HOCKEN,  
THOMAS LEAN, RICHARD MARTIN.

*Wheal Agar Mine, Nov. 28, 1849.*

GENTLEMEN,—There has been a good deal of your Fuse used at our mine, and we can safely pronounce it to be as good an article as we ever saw.

Messrs. W. Brunton & Co. ALEX. EUDEY, Manager. JOSEPH EUDEY.

*South Roskear Mine, Nov. 29, 1849.*

GENTLEMEN,—Your Fuse is a capital article, so far as our experience of it goes. It is well made, and certain in its operation. The men have brought no complaints of it, nor has a single accident occurred with it.

Messrs. W. Brunton & Co. WILLIAM THOMAS, JOHN DUNKIN.

*North Roskear Mine, Nov. 30, 1849.*

GENTLEMEN,—All the Fuse you have sent to this mine, during several months past, has been as good as we have ever had from the other Fuse factories. There has been no fault found with it, nor has there been any accident in using it.

Messrs. W. Brunton & Co. JOSEPH VIVIAN, Manager, JOHN HODGE.

*Cook's Kitchen Mine, Nov. 29, 1849.*

GENTLEMEN,—We very cheerfully give our testimony to the good quality of your Fuse—for eight months we have used it, and no accident has occurred.

Messrs. W. Brunton & Co. JOSEPH VIVIAN, Manager, JOHN IVEY,  
W. G. HILL, RICHARD BENNETTS.

## ADVERTISEMENTS.

*Carn Brea Mine, Nov. 29, 1849.*

GENTLEMEN,—We have used 9,000 coils of your Fuse in our mine in the course of the last eight months, and have pleasure in stating that not a single case of accident has arisen therefrom, and we consider your Fuse as good as any that is made.

Messrs. W. Brunton & Co.	R. H. PIKE, Purser, JOHN LENTEN, } Man. JAMES MINERS, } Agents, WILLIAM ROBERTS,	ABSALOM BENNETTS, JOHN VIVIAN, JOHN JAMES, JOHN DAW.
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*Penhellick Fuse Factory.*

GENTLEMEN,—We have used, and are still using, your Fuse, and have no hesitation in expressing our conviction that it is, in all respects, entitled to the character of *Safety Fuse*, being as good an article, and as safe in use, as any we have seen.

Messrs. W. Brunton & Co.	WILLIAM JEFFERY, } JOSEPH MICHELL, } Lanarth Mine. WM. H. VERRAN, East Wheal Fortune. WILLIAM WILLIAMS, Manager, FRANCIS BENNETTS, JAMES WILLIAMS, JOSEPH PEARSE, FRANCIS KENT,	} Wheal } Friendship } Mine.
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*Prestonpans Colliery, Edinburgh, Sept. 17, 1849.*

GENTLEMEN,—The miners inform me that the Fuses are of excellent quality, and have not lost a single shot since the commencement; while, with some of a very similar appearance we used before, nearly half the charges missed fire.

Messrs. W. Brunton & Co.

JOHN GRIEVE.



# BICKFORD'S PATENT SAFETY FUZE

FOR

CONVEYING FIRE TO THE CHARGE IN BLASTING ROCKS,

Has a thread wrought into its centre, which being Patent right, infallibly distinguishes the genuine article from all imitations and insures the continuity of the Gunpowder.

**Manufactured by greatly Improved Machinery,**

PROTECTED BY A SECOND PATENT.

BICKFORD, SMITH, AND DAVEY,  
CAMBORNE, CORNWALL.

ADVERTISEMENTS.

BY HER MAJESTY'S ROYAL LETTERS PATENT.

## JENKYN'S PATENT HYDRAULIC VALVES,

FOR

Mining, Shipping, or other Pumps for Raising and Pumping Water and other Liquids.

Having obtained a Patent for the invention of that description of valves called Valves for Hydraulic Machines, or any Machines for raising and Pumping Water and other Liquids, I beg to remark, that I considered for many years that there was something of this kind wanted in deep mines, on account of the great expense of the common valves, which have been in use for many years past, occasioned by the loss of both valves and lifts, which led me to the invention of the above, and which I can most strongly recommend for their great easement to the engines, works, &c., and also their durability, and other good qualities, as I have seen them repeatedly tested, and which the annexed Testimonials, and Orders I have received for them, will fully testify and bear me out, from the time they were first used to the present period.

I shall be happy to give any further information respecting them, and to receive orders for their supply, which shall meet my best attention.

No. 1, Glanville-street, Plymouth.

RICHARD JENKYN.

### Testimonials.

I am glad to be able to state that there is no comparison to be drawn between your Valves and others which have been tried in the same sett. Yours have been working since the commencement, and are still. Please inform me what the present price is for 20-inch Valves. With kind respects,

JOHN EVANS, Dowlais.

I have used the Patent Valves four years without repair, and have now taken them out, and with little repair will last four years again, if you can get a proper person to put them to work,\* they will be the best Valves that ever were recommended in Cornwall; and I further add, that I would advise their general use.

T. BLACKWELL, Dowlais.

\* I have made such improvements that a common pitman can put them in.

Please to send me four of your Patent Valves, the same size as you sent me last.

JOHN EVANS, Dowlais Iron-Works.

I herewith send you an order for two of Jenkyn's Patent Valves, the same size as you made for the Cobre Mine, Cuba; I think they were made all of brass—those they have are working very well.

JAMES SIMS, Redruth.

Your Patent Valves have been at work at these works for about seven years; the lifts are about 40 fathoms high and 20 inches diameter; they work from about three to four strokes per minute, and on an average more than two years without any repairs; the lifts rise a quantity of rubbish on the Valves, and might have worked longer in clear water.

SAMUEL TRURAN, Dowlais.

The pump you put to work here in November, 1849, with your Patent Valves, has been in constant use, day and night, ever since, and as far as the Valves are concerned, to my perfect satisfaction; and considering that the well is between 80 and 90 feet from the pump, with a lift of nearly 30 feet, especially when the water is low, gives a strong proof of the superiority of your valves over any others I have ever seen tried.

FRANCIS WARREN, Stowford Paper Mills,  
Ivy-bridge, Devon.

Having had several opportunities of witnessing the superiority of your Patent Valves, which I have no doubt will ultimately supersede all others, I have much pleasure in recommending them for all mining purposes, and for any work where heavy pumping is required; and I feel assured they will be found far more economical than any other valves now in use on the old principle.

JOHN E. MARE, Plymouth Foundry, Hammer  
Mills and Engine Works.

N.B.—Other Testimonials can be produced.



**NICHOLLS, WILLIAMS, & CO.,**

**IRON FOUNDERS & ENGINEERS,**

**BEDFORD IRON WORKS, TAVISTOCK,**

**AND**

**ROSELAND VALE FOUNDRY & HAMMER-MILLS,  
LISKEARD.**

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**MANUFACTURERS of STEAM ENGINES of every description  
for Mining and other purposes.**

**MINE WORK of every description.**

**WROUGHT IRON in all its various branches ; HAMMERED IRON,  
warranted from the Best Scrap.**

**BOILERS MADE ON THE SHORTEST NOTICE.**

**CHAINS OF ALL SIZES.**

**FOREIGN MINES supplied with MATERIALS and TOOLS of  
every description, and**

**ENGINEERS, if required for erecting, sent to any part  
of the Kingdom.**

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**All Materials warranted to be of the best quality,  
and made on the shortest possible notice.**

## **VENTILATION OF COAL MINES.**

### **BIRAM'S PATENT ANEMOMETER.**

This INSTRUMENT has now been Successfully Employed by many Eminent Engineers, to whom Reference can be given.

For Particulars apply either to the Inventor, B. Biram, Esq., Wentworth, near Rotherham; or to the Maker, John Davis, Derby, Manufacturer of Miners' Dials, Clinometers, Safety Lamps, and all kinds of Instruments appertaining to the Engineer, are made and kept in stock. —Repairs promptly attended to. J. DAVIS, Irongate, Derby.

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## **ASSAYING AND ANALYSIS.**

TO THE MANAGERS AND OWNERS OF MINES AND MINERAL PROPERTY, METAL BROKERS, METALLURGISTS, AND MANUFACTURERS GENERALLY.

Assays and Analyses of Minerals, Metals, Soils, Furnace, and all other Manufacturing Products are conducted by Mr. MITCHELL, at the Laboratory, 23, Hawley-road, Kentish-town.

Mr. M. also offers his services to Inventors, and Intending Patentees, in enabling them to perfect and carry out their Invention in any direction in which an intimate knowledge of Chemistry in its application to the Arts and Manufactures is requisite.

Instruction in all branches of Assaying, Analysis, and Metallurgical and Manufacturing Chemistry.

Communications to be addressed to Mr. MITCHELL, 23, Hawley-road, Kentish-town.

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## **TOUGHENED CAST-IRON.**

### **STIRLING'S PATENT.**

No. 1.—For SMALL and MEDIUM CASTINGS.

No. 2.—For HEAVY CASTINGS.

No. 3 (*Extra*).—For ROLLS, HEAVY SHAFTS, and VERY HEAVY CASTINGS.

The above is by far the strongest CAST-IRON made, and is now being extensively used where strong Castings are required.

Further particulars may be obtained on application to

Messrs. GARDEN and MACANDREW, 27, Queen-street, Cheap-side, from whom also the IRON can be procured.

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## **RAILWAY CARRIAGE AXLE, LOCOMOTIVE AND MARINE ENGINE BEARINGS.**

### **OF STIRLING'S PATENT METAL.**

These alloys are found to be superior to every other composition and metal for the above purposes, and are in extensive use on Railways and in Marine and General Engines. They do not heat in friction, nor injure the axle or shaft, and they wear much longer, while they are cheaper, and in every respect more economical, than any other metals.

Castings of all descriptions, for general machinery, to be obtained of MEARS and Co., Ordnance and Brass Foundry and Patent Metal Works, Fieldgate-street, Whitechapel.

ADVERTISEMENTS.

JOSEPH DEELEY,

OF THE

LONDON AND NEWPORT IRON WORKS, NEWPORT,  
MONMOUTHSHIRE,

Respectfully recommends to the notice of the public his PATENT FOUNDRY FURNACE, which has been effectually tested, and is now in constant use at the above works, where it may be seen by all persons interested. This furnace operates without the aid of any motive power to impel the air. An immense saving is the consequence, both in erecting and working. One-third of the coke usually consumed is more than sufficient; a loss of only 22 lbs. of iron to the ton is sustained in smelting. It is also available for large or small work of every description, and may be tapped out as required.

The IRON MELTED in this furnace also undergoes an extraordinary improvement in quality.

SCOTCH PIG and SCRAP are returned equal to cold-blast in point of strength, and capable of being chipped or filed with the greatest facility.

FOUNDRIES USING this FURNACE may exist in the most densely-populated cities, without causing the least nuisance—all smoke, dust, and noise being avoided.

The Continental, Colonial, Scotch, and Irish PATENT RIGHTS are for disposal; the Patentee would also treat for the Purchase of Patent Rights, or grant Licences to manufacture for certain counties or districts in England or Wales.

APPLY TO THE PATENTEE AS ABOVE.

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H. COLWELL,

TRUSS AND INSTRUMENT MAKER,

76 A, CHEAPSIDE,

BEGS TO CALL ATTENTION TO THE FOLLOWING

Testimonials of the Press.

“Mr. Henry Colwell’s Trusses, designed for Prolapsus Ani, are admirable in their construction, and for the efficacy with which they perform their office; but those which are intended for Prolapsus Uteri are the most perfect instruments we have ever seen.”—*The Chemist*.

“In science and skill, in adapting his Trusses to the peculiar circumstances of the case, Mr. Colwell is inferior to no artist in London.”—*United Service*.

“Mr. Colwell has, in the most philanthropic and praiseworthy manner possible, broken through the extortionate system so long pervading the Truss-making-trade. His inventions for Prolapsus surpass anything of the kind we have ever seen, and are not more than one-third the price charged by other manufacturers.”—*Sun*.

“Mr. Colwell has combined lightness of spring and delicacy of workmanship with the greatest security, ease, and comfort to the patient.”—*Reading Mercury*.

“Mr. Colwell is an eminent Truss-maker.”—*Morning Herald*.

## CURE FOR RUPTURE.

---

TO MR. COLES.

(From the late Dr. THORNTON, the eminent Botanist.)

“SIR,—After six months wearing a truss of your construction, I am perfectly cured of an inguinal hernia, which was in appearance the size of a watch, and which had existed for six months. I am happy now to inform you that I have left off my truss for a fortnight, and have not experienced any descent of the hernia. I, therefore, most heartily wish you that success which your ingenuity so amply deserves.

“36, Howland-street, Fitzroy-square, June 22, 1830.”

THOMAS RICHARDSON, Esq., of Lombard-street, writes thus :—

“10th first month, 1834.

“‘Coles’s Truss is the best.’

“I am ready to subscribe to the truth of this assertion, which appears on the front—I will not say ornaments his establishment at Charing-cross; and I do it from personal experience, having in the course of thirty years, tried a great many Trusses; I have recommended his Trusses to several medical characters, and intend, if I live, to continue to do so, being convinced that, in promoting the general adoption of Coles’s Truss, I am serving not only a meritorious mechanician but also the cause of humanity.”

“The British Museum, Nov. 9, 1848.

“SIR,—Having suffered much from the use of imperfect Trusses, I had recourse to your patent, two of which I wore sixteen years, which cured me completely; I have now the pleasure to say, that for the last two years I have not had a Truss on my person.

“Yours, with gratitude,

“WILLIAM LEACH.”

“The Rev. Dr. DOWDESWELL informs Mr. Coles that, for many years before he called at his establishment, at Charing-cross, he had worn Trusses, got up, as he supposed, by the best London makers; but he considers it due to Mr. Coles to acknowledge that his Patent Trusses, which he has also worn for many years, are as much superior to those which he had formerly used as words can possibly describe them.

“Dr. D., in authorizing Mr. Coles to give it publicity, feels assured that he is conferring a boon on society.

“48, Upper Grosvenor-street, Grosvenor-square, May 15, 1848.”

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MANUFACTURED ONLY BY

WILLIAM COLES,

Truss-maker to the Forces,

3, CHARING-CROSS.

A LETTER ON THE SUBJECT OF HERNIA IS TWO-PENCE.



## PLANTAGENET GUARD RAZOR.

*By Royal Letters Patent.*

UNDER THE ESPECIAL PATRONAGE OF

The NOBILITY and GENTRY, the ARMY and NAVY, the CLERGY,  
the BAR, and the FACULTY.

This Guard Razor is made of the finest tempered steel, imparting a matchless smoothness and keenness to the edge; and the addition of the moveable Guard causes the Razor to glide with safety over the face, *removing the beard without cutting the skin.*

Every Razor is warranted, and will be exchanged, if imperfect.

Printed descriptive particulars sent post free.

Prices:—Best Ivory Handles, per pair, 16s.; Black ditto, 12s.; sent post free for 8d. each extra. A pair with Ivory Handles in Russia Box, One Guinea; post free, 1s. 6d. extra. A single Razor, with splendid electro-gilt Guard in Roan Case, Half-a-Guinea.

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C. STEWART & CO., PATENTEES,

22, CHARING CROSS.

CAUTION.—Every Guard is stamped with the Patentees' signature of  
"C. STEWART and CO.," to imitate which is forgery.

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"To all men a source of comfort."—*Morning Herald.*

"Among the most valuable discoveries of modern times."—*Morning Post.*

"We have great pleasure in recommending it."—*Observer.*

"Every possibility of cutting the skin is avoided, while the perfect removal of the hair is secured."—*Sunday Times.*

"This guarded razor is really a splendid invention."—*Lancet.*

"It offers an infallible impediment to the injuries resulting from carelessly handling a razor."—*United Service Gazette.*

"An admirably contrived and wonderfully safe instrument—a perfect paragon of a shaving tool."—*John Bull.*

"Shaving is performed with the greatest freedom and ease, and with perfect safety."—*Mining Journal.*

"A perfect skin preserver."—*Douglas Jerrold.*

"Like all other really clever inventions, exceedingly simple."—*Era.*

"A most simple and a most ingenious contrivance."—*Nonconformist.*

"A very useful and important discovery."—*Standard of Freedom.*

"It is calculated to surprise us by its beautiful simplicity."—*Magazine of Science.*

"We have tried it in the dark."—*Tablet.*

"A man may safely shave with such a razor in all weathers."—*Times.*

ADVERTISEMENTS.

CONSIDERABLE SAVING IN FUEL.

IMPORTANT IMPROVEMENT

IN

THE DOMESTIC COOKING STOVE.

This design has for its object an improved formation of the Oven of the Domestic Cooking Stove, in such a manner that it shall be more quickly and readily heated and kept ready for use, than by the formation hitherto adopted. The improvement consists in a different adaptation of the flues round the oven. The latter is divided into two portions by a flue, which passes between them, thus really forming two ovens. Supposing the fire-grate to be on the left side of the ovens, the fire keeps up a great degree of heat against the left side of the upper oven, but not sufficient to burn it, there being a space between opening to the flues; the current of flame and heated products of combustion then pass along the top of the upper oven, down its right-hand side, along its lower part, from right to left, between the upper and lower ovens; down the left side of the latter, along its lower surface, from left to right, and up its right side, where it passes off into the chimney. By this arrangement it will be seen that the top, bottom, and both sides of both ovens are effectually open to the draft, and must become thoroughly heated in a very short period. The following few, from many, Testimonials, bear witness to the thorough success of this simple but improved arrangement.

JOSIAH SIMS, Inventor and Proprietor, Tavistock.

LICENCES GRANTED.—ALL ORDERS PROMPTLY EXECUTED.

TESTIMONIALS.

"I have great pleasure in bearing testimony to the great improvement made in my stove by your Improved Oven being added to it; the time required for baking being less than half, and can clearly say the saving in fuel is full 50 per cent. I shall be glad at all times to show it to any persons desirous of seeing it.

"THOMAS NICHOLLS, Bedford Iron-Works, Tavistock."

"In reply to your question as to the answering of, and benefit derived from, the alteration of my oven to your principle, I beg to say, that we find that one-half the coals will dress a large joint better and quicker than on the old plan; the oven I previously had was considered a very good one. I must also add, that it may be regulated to the greatest nicety by attention to the dampers, so as to suit poultry, &c.

"J. L. COMMINS, Brook Cottage, Whitchurch."

"From the experience I have had from putting in your Improved Registered Stoves, and seeing a considerable saving of fuel, I have gone to the expense of having one for my own use, and find a saving of one-half the coals.

"RICHARD H. YELLAND, Builder, Tavistock."

"I am proud to be able to say that your Improved Registered Stove sent me answers everything as you represented; and I am at a loss to know how such a simple, but effectual, improvement should have been so long dormant.

"W. NEWTON, Mill-hill."

"I am fully convinced of the advantage derived from your Improved Cooking Stove, and have found the meat, bread, &c., for my family has been cooked cheaper and better than by sending it to a common oven, and could, therefore, most confidently recommend it to the public, as the most economical that has ever come under my notice.

"JOHN JAMES, Tin-plate Worker, Exeter-street, Tavistock."

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